VAPOR INTRUSION ASSESSMENT WORK PLAN (REVISION 4)

CTS OF ASHEVILLE, INC. SUPERFUND SITE

235 Mills Gap Road
Asheville, Buncombe County, North Carolina
EPA ID: NCD003149556
CERCLA Docket No. CERCLA-04-2012-3762

Prepared for:

CTS Corporation
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Prepared by:

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AMEC Project 6252-12-0006

March 14, 2014

March 14, 2014

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Subject: **Vapor Intrusion Assessment Work Plan (Revision 4)**
CTS of Asheville, Inc. Superfund Site
235 Mills Gap Road, Asheville, Buncombe County, North Carolina
EPA ID: NCD003149556
CERCLA Docket No. CERCLA-04-2012-3762
AMEC Project 6252-12-0006

Dear Ms. Urquhart-Foster:

Please find attached the Vapor Intrusion Assessment Work Plan (Revision 4; VI Work Plan) for the above-referenced Site. AMEC Environment & Infrastructure, Inc. prepared this VI Work Plan on behalf of CTS Corporation pursuant to the requirement set forth in Section 1.3.4 of the Scope of Work contained in Appendix A of the Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study between the United States Environmental Protection Agency Region 4 (USEPA) and CTS Corporation (effective date of January 26, 2012).

In a letter dated February 28, 2014, the USEPA provided comments on Revision 3 of the VI Work Plan, which was submitted to USEPA on December 10, 2013. Based on the comments provided by USEPA, appropriate modifications to the VI Work Plan, Field Sampling and Analysis Plan, and Quality Assurance Project Plan have been made. General comments regarding the crawlspace to indoor air attenuation factor are discussed below.

In a July 23, 2012, memorandum regarding comments to a previous version of the VI Work Plan, USEPA recommended an attenuation factor of 0.9 be used for the preliminary evaluation of indoor air concentrations. The February 28, 2014, USEPA comment letter indicates an attenuation factor of 1.0 should be used for the preliminary evaluation of indoor air concentrations. Per the document referenced in the comments, ("EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings," March 2012), the arithmetic mean crawlspace attenuation factor for the national data set (with attenuation factors ranging between 0.057 and 0.92) is 0.46, with a standard deviation of 0.28. The 95 percent upper confidence limit of the arithmetic mean is 0.53, which is recommended as both applicable and protective for screening purposes. USEPA's recommended

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attenuation factor of 0.9 (or 1.0) is associated with the 95th percentile of the data set, and is overly conservative.

In the case of the proposed air sampling included in this Revision 4 of the VI Work Plan, both crawlspace air samples and indoor air samples will be collected from the residences. Therefore, an attenuation factor calculated or derived from USEPA draft guidance and a database study is not necessary for this scope of work.

If you have questions regarding this revised VI Work Plan, please contact us at (828) 252-8130.

Sincerely,

AMEC Environment & Infrastructure, Inc.

Susan E. Kelly, P.E., L.G.
Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 032067 3/14/14 ENGINEER SUSAN E. KELLY

Matthew E. Wallace, P.E.
Principal Engineer

for Matthew E. Wallace
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SEK/MEW:sek

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LIST OF ACRONYMS

AMEC	AMEC Environment & Infrastructure, Inc.
COPC	constituent of potential concern
FSAP	Field Sampling and Analysis Plan
HASP	Health and Safety Plan
OSWER	USEPA Office of Solid Waste and Emergency Response
ppbv	parts per billion volume
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RI/FS	Remedial Investigation/Feasibility Study
TCE	trichloroethene (also, trichloroethylene)
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	volatile organic compound

DOCUMENT REVISION LOG

Revision	Date	Description
0	3/09/2012	Initial Issuance
1	7/12/2012	Revisions based on comments received from USEPA in a letter dated June 5, 2012 (“Comments on the Vapor Intrusion Assessment Work Plan”).
2	9/11/2012	Revisions based on comments received from USEPA in a memorandum dated July 23, 2012 (“CTS of Asheville – 2012 Vapor Intrusion QAPP - QAS Review Memorandum 7/23/2012”).
3	12/9/2013	Revisions based on comments received from USEPA in a letter dated November 25, 2013 (“Request for Revision of Vapor Intrusion Assessment Work Plan - CTS of Asheville, Inc. Superfund Site”).
4	3/14/2014	Revisions based on comments received from USEPA in a letter dated February 28, 2014 (“Comments on the Vapor Intrusion Assessment Work Plan (Revision 3) - CTS of Asheville, Inc. Superfund Site”).

1.0 INTRODUCTION

This document presents the Vapor Intrusion Assessment Work Plan (VI Work Plan) associated with the CTS of Asheville, Inc. Superfund Site (Site) located at 235 Mills Gap Road in Asheville, Buncombe County, North Carolina (Figure 1). The activities described in this VI Work Plan will be performed pursuant to Section 1.3.4 of the Scope of Work contained in Appendix A of the Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study (Settlement Agreement) between the United States Environmental Protection Agency (USEPA) Region 4 and CTS Corporation (effective date January 26, 2012). This VI Work Plan describes the proposed activities that will be undertaken to evaluate potential vapor intrusion at residences located contiguous to the Site and proximate to the currently known contaminated groundwater plume.

1.1 SITE DESCRIPTION

The Site is approximately nine acres on Mills Gap Road in Asheville, Buncombe County, North Carolina and the areal extent of the contamination. The approximate center of the Site is located at north latitude 35°29’36” and west longitude 82°30’25”. The Site formerly contained an approximate 95,000-square foot, single-story brick and metal structure in the southern portion of the Site. The building was demolished in December 2011 and the concrete building pad remains intact. The northeastern portion of the Site contains an asphalt-paved parking area and asphalt-paved driveways are located parallel to the north (front) of the building and southeast (rear) of the building. A six-foot high chain-link fence surrounds the Site and a locked gate at the north end of the Site controls access to the Site from Mills Gap Road. The Site is unoccupied.

1.2 SITE OPERATIONAL HISTORY

International Resistance Company owned and operated a manufacturing facility at the Site from 1952 until 1959, when CTS of Asheville, Inc. purchased the real property, building, and equipment. CTS of Asheville, Inc. manufactured electronic components at the facility from 1959 until April 1986. Arden Electroplating, Inc. leased a portion of the building from approximately December 1, 1985 until November 30, 1986, and the Site was conveyed to Mills Gap Road Associates (MGRA) on December 23, 1987. MGRA reportedly leased portions of the facility to various tenants, and otherwise utilized the

building for business interests. The Site has been vacant/unoccupied since the mid-1990s.

Electronic components utilized in automotive parts and hearing aids were manufactured at the Site until plant operations ceased in April 1986. Small electronic components were electroplated with tin, nickel, zinc, and silver as one step in the process. Wastes generated from the process included sludge containing heavy metals and solvents. Solvents, including trichloroethene (TCE) and acetone, were used in the process to clean and/or degrease metal objects prior to electroplating. Disposal/recycling activities at the facility prior to 1959 are unknown. From 1959 to 1986, solvents and metals were reportedly reclaimed whenever possible. Between 1959 and 1980, metal-bearing rinse waters and alkaline cleaners that could not be reclaimed from the electroplating process were reportedly disposed of through the city sewer system, while concentrated metals and solvent wastes were placed in drums for off-site disposal/recycling. After 1980, all wastes were accumulated in drums on-site prior to off-site disposal or recycling.

1.3 PREVIOUS ASSESSMENT ACTIVITIES

The results of previous assessments determined that unsaturated soil containing VOCs is limited to the former plant area of the Site and that a contaminated groundwater plume is present at and adjacent to the Site. The groundwater plume in the unconsolidated formation (i.e., above bedrock) has generally been delineated to the north and the south, but not to the east and west of the Site. The primary constituents detected in soil and groundwater samples collected during previous Site investigations include VOCs related to chlorinated solvents, such as TCE, and petroleum constituents related to fuel oil.

Previous assessment activities conducted by USEPA included air sampling and air monitoring in the area of the Site. In December 2007, 10 subslab and 12 crawlspace (SUMMA® canister) air samples were collected from 22 residences in the area of the site, as well as ambient air and 'slam bar' soil gas samples (T N & Associates, 2008). A Trace Atmospheric Gas Analyzer IIe was also used to screen air quality in the area of the Site. In August 2008, USEPA returned and collected five crawlspace air samples, two indoor air samples, and one soil gas sample (as well as ambient and duplicate air samples) from six residences in the area of the Site (T N & Associates, 2009). Eight of the twenty-one air

samples (not including the trip blank) collected in August 2008 did not contain TCE above laboratory reporting limits. Of the thirteen air samples where TCE was detected above the laboratory reporting limits, one air sample collected from inside the restricted-access fenced area at the springs to the east of the Site contained a concentration of TCE above the then applicable removal action limit of 23 parts per billion by volume (ppbv). The highest analytical result of TCE in the remaining twelve air samples where TCE was detected was 1.6 ppbv.

In October 2012, two crawlspace air samples, one indoor air sample, and one duplicate crawlspace air sample were collected from three residences in the area of the Site (AMEC, 2013). Two ambient air samples and one duplicate ambient air sample were also collected. Concentrations of TCE, cis-1,2-dichloroethene, and/or vinyl chloride were detected above the laboratory reporting limits in the collected air samples. The detected concentrations of TCE ranged from 0.055 to 0.12 ppbv in the crawlspace/indoor air samples. The detected concentrations of TCE ranged from 0.027 to 0.12 ppbv in the ambient air samples.

1.4 OBJECTIVES OF VI ASSESSMENT

The objective of the Vapor Intrusion Assessment is to determine whether concentrations of Site-related VOCs are present in crawlspaces and/or indoor air at residences previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. The detected analytes, if any, will be compared to risk-based screening values to indicate the potential for the occurrence of vapor intrusion to pose a potential risk to the residential receptors. The purpose of comparing the measured air concentrations to the screening levels is to identify constituents of potential concern that will then be further evaluated by a risk assessment. An exceedance of a screening value does not indicate unacceptable risk or hazard for receptors. As additional data is collected during implementation of the RI/FS, this VI Work Plan may be modified to include additional sampling locations/events.

2.0 PROPOSED VAPOR INTRUSION ASSESSMENT

The proposed VI Assessment is described in the following sections. The Sampling and Analysis Plan for implementation this VI Work Plan consists of a Field Sampling and Analysis Plan (FSAP) and Quality Assurance Project Plan (QAPP). The FSAP (Appendix A) describes the data gathering methods, sampling objectives, sample locations and frequency, and sampling equipment and procedures. The QAPP (Appendix B) describes the project objectives and organization, functional activities, and the quality assurance and quality control (QA/QC) protocols that will be used to achieve the desired data quality objective for the project.

2.1 PROPOSED SAMPLE LOCATIONS

In accordance with Section 1.3.4 of the Settlement Agreement Scope of Work, this VI Assessment will evaluate vapor intrusion at residences previously assessed by USEPA that are immediately contiguous to the Site and/or proximate to the currently known groundwater plume. Crawlspace and indoor air samples will be collected from two residences at the locations shown in Figure 2. Four ambient air samples associated with the crawlspace/indoor air samples will also be collected. The locations of the ambient air samples will be dependent on the predominant wind direction at the time of sampling, and the proximity to previously identified surface waters containing Site-related VOCs.

2.2 ACCESS AGREEMENTS

Vapor intrusion assessment access authorization agreements for the [redacted], [redacted] and [redacted] residences were provided to the Respondent by the USEPA on November 25, 2013. The residence at [redacted] is currently unoccupied, so crawlspace/indoor air samples will not be collected from this residence at this time.

2.3 PROPERTY OWNER NOTIFICATION

Prior to commencing the air sampling event, property owners will be notified by USEPA of the upcoming sampling activities. USEPA will coordinate the timing and logistical issues associated with the sampling activities.

2.4 PROPERTY RECONNAISSANCE

Prior to collecting air samples, the interior of each residence will be surveyed to collect information about the structure (e.g., configuration, presence/absence of a vapor barrier, heating/cooling systems, etc.) and to assess factors that could influence the air sampling results (e.g., products or chemicals containing VOCs). An Occupied Dwelling Questionnaire, such as the one included in Appendix C, will be completed in coordination with the occupant of the residence prior to initiating the air sampling activities.

2.5 COLLECTION OF AIR SAMPLES

Prior to collection of air samples, products or chemicals potentially containing Site-related VOCs will be attempted to be identified in the structure. Crawlspace air samples will be collected in the center of the crawlspace of the structure, or in the general location of previous samples collected by USEPA, if possible or applicable. Indoor air samples will be collected with the sample intake positioned at a height of two to four feet above the floor of the residence in an area that has the potential for frequent use. Ambient air samples will be collected from a height of three to five feet above the ground. The air samples will be collected using individually-certified, 6-Liter, electropolished, stainless steel (SUMMA®) canisters equipped with flow controllers. The samples will be collected over a 24-hour period.

2.6 ANALYSIS OF AIR SAMPLES

The air samples will be submitted for analysis of Site-related VOCs according to USEPA Method TO-15 SIM (selective ion monitoring).

2.7 HEALTH AND SAFETY

A Site Health and Safety Plan (HASP) has been developed specific to the Site activities and has been submitted to the USEPA under separate cover. The HASP applies to AMEC employees and AMEC subcontractors. Field teams will have a copy of the HASP during field activities. Personnel involved in the air sampling activities will be required to read, understand, and conform to the requirements of the HASP.

If the Field Operations Leader or Project Manager determines that sampling activities cannot be conducted due to the proximity of unauthorized persons or other unforeseen conditions or situations, the sampling activities will cease until such time as they can safely be resumed. USEPA will be notified of such occurrences.

2.8 REPORTING

A Vapor Intrusion Assessment Report will be prepared and submitted to USEPA. The Report will provide a description of the sampling and analysis activities, a tabulation of the analytical results, and a vapor intrusion risk evaluation, as described below.

A screening-level assessment of potential human health risk associated with detected analytes in the air samples (after data validation and QA/QC evaluation), will be performed. This preliminary risk evaluation will be performed in accordance with the USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002) and Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment; USEPA, 2009).

For screening purposes, detected indoor air concentrations will be directly compared to ambient air concentrations (background) and USEPA's most current residential air Regional Screening Levels. Detected crawlspace concentrations will be compared to the USEPA indoor air screening level concentrations divided by a crawlspace to indoor air attenuation factor of 0.53, which is the 95 percent upper confidence limit of the arithmetic mean for crawlspace to indoor attenuation factors assembled by USEPA (Table 19 in USEPA, 2012). The resulting screening values will be compared to the crawlspace air sampling results to assess whether potential indoor air exposures should be further evaluated through additional data collection and/or quantitative risk assessment. This crawlspace attenuation factor is based on data presented in "EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings" (March 2012). In USEPA's March 2012 report, empirical crawlspace attenuation factors were calculated by dividing an indoor air concentration measured in a building by the measured crawlspace concentration in the same building. Per this reference, the mean crawlspace attenuation factor for the national

data set is 0.46 with a standard deviation of 0.28. The calculated attenuation factors in the study ranged from 0.057 to 0.92. These attenuation data are primarily based on studies conducted in the northeastern and western United States. Crawlspace air samples will also be compared to ambient air concentrations.

The building attenuation factor, which expresses the ratio of the indoor air concentration arising from vapor intrusion to the crawlspace soil gas concentration, is dependent on numerous site-specific building construction conditions. These site-specific factors include construction and integrity of the building foundation, pressure differences between the subsurface and the building interior, the indoor air exchange rate, interior ventilation and air flow, and the size, geometry, and compartmentalization of the building (USEPA, 2012). Typically homes in the southeastern United States are not as “air-tight” in construction as buildings in the northeastern United States. Therefore, the crawlspace attenuation factor of 0.53, which is the 95 percent upper confidence limit of the arithmetic mean for crawlspace to indoor attenuation factors assembled by USEPA (Table 19 in USEPA, 2012), is recommended as both applicable and protective for screening purposes.

The objective of the risk evaluation is to:

- Identify constituents of potential concern (COPCs) in air through comparison to risk-based screening values published by USEPA, including residential air Regional Screening Levels and Office of Solid Waste and Emergency Response generic screening levels for the vapor intrusion pathway.
- Calculate cumulative hazard indices for non-carcinogenic COPCs and cumulative excess cancer risk estimates for potentially carcinogenic COPCs using residential exposure assumptions.
- Make a recommendation concerning whether additional sampling is warranted or whether corrective action to minimize residential exposures is indicated.

The Vapor Intrusion Assessment Report will be submitted to USEPA within 45 days of receipt of the analytical results. Draft transmittal letters to property owners will be submitted to USEPA with the Vapor Intrusion Assessment Report. The draft transmittal letters will be prepared in accordance with “Communicating Environmental Data to Property Owners and Tenants” (USEPA, 2010).

3.0 SCHEDULE

The proposed schedule for the implementation of the Vapor Intrusion Work Plan is presented below.

Activity	Time to Complete
USEPA approval of VI Work Plan	30 days after submittal (assumed 30-day review/approval period)
Commence implementation of VI Assessment	Within 30 days of USEPA approval of VI Work Plan
VI Assessment field activities	Estimated 3 days to complete
Receive laboratory data	Within estimated 21 days of sample collection
Vapor Intrusion Assessment Report	Within 45 days after receipt of laboratory data

4.0 REFERENCES

AMEC, 2013. Vapor Intrusion Assessment Report (Revision 1), CTS of Asheville, Inc. Superfund Site EPA ID: NCD003149556, February 12, 2013.

T N & Associates, Inc., USEPA Region 4 START, 2008, Subsurface Soil and Groundwater Sampling Report, Revision 1, Mills Gap, April 23, 2008.

T N & Associates, Inc., USEPA Region 4 START, 2009, Vapor Sampling Letter Report, Revision 2, Mills Gap, June 16, 2009.

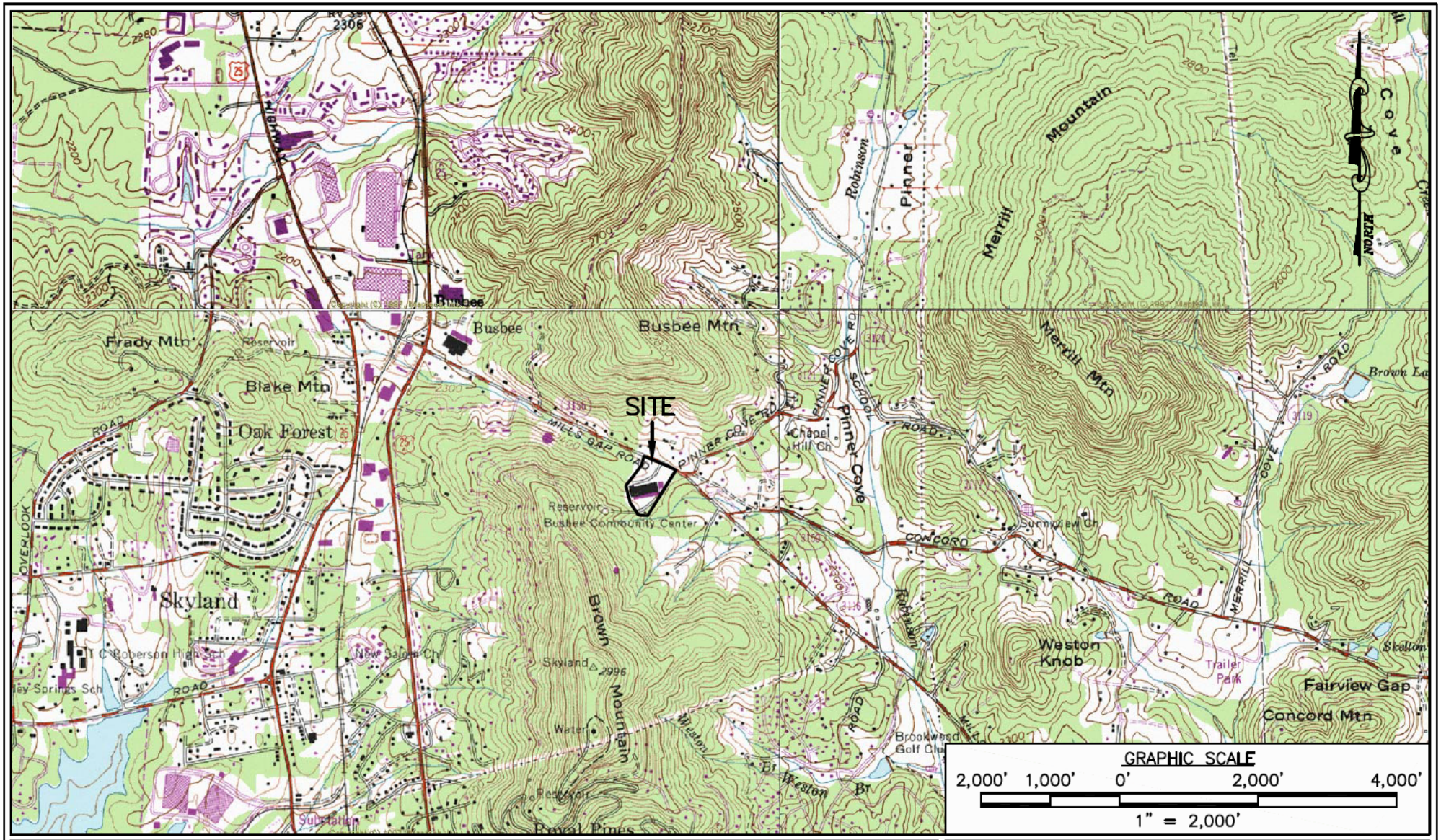
USEPA, 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), EPA530-D-02-004, November 2002.

USEPA, 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final, EPA-540-R-070-002, January 2009.

USEPA, 2010. Communicating Environmental Data to Property Owners and Tenants (Standard Operating Procedure, Version #1), Interim Final, October 2010.

USEPA, 2012. EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings, EPA 530-R-10-002, March 16, 2012.

FIGURES



TOPOGRAPHIC SITE MAP
CTS OF ASHEVILLE, INC. SUPERFUND SITE
ASHEVILLE, NORTH CAROLINA

amec

DRAWN: SEK	ENG CHECK: --	DATE: MARCH 2014	PROJECT: 6252-12-0006
DFT CHECK: MEW	APPROVAL: MEW	SCALE: 1" = 2,000'	FIGURE: 1

REFERENCE: USGS QUADRANGLES: ASHEVILLE (1961), OTEEN (1962), FRUITLAND (1978) AND SKYLAND (1978)

PROPOSED AIR SAMPLE LOCATIONS
CTS OF ASHEVILLE, INC. SUPERFUND SITE
ASHEVILLE, NORTH CAROLINA

amec

DRAWN: SEK	ENG CHECK: --	DATE: MARCH 2014	PROJECT: 6252-12-0006
DFT CHECK: MEW	APPROVAL: MEW	SCALE: 1" = 200'	FIGURE: 2

REFERENCE: 2010 AERIAL PHOTOGRAPH FROM BUNCOMBE COUNTY GIS WEBSITE.

APPENDIX A

FIELD SAMPLING AND ANALYSIS PLAN

VAPOR INTRUSION ASSESSMENT WORK PLAN: FIELD SAMPLING AND ANALYSIS PLAN (REVISION 4)

CTS OF ASHEVILLE, INC. SUPERFUND SITE

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LIST OF ACRONYMS

AMEC	AMEC Environment & Infrastructure, Inc.
COC	chain-of-custody
FSAP	Field Sampling and Analysis Plan
FOL	Field Operations Leader
GPS	Global Positioning System
Hg	mercury
IDW	investigation derived waste
PID	photoionization detector
QAPP	Quality Assurance Project Plan
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	volatile organic compound

DOCUMENT REVISION LOG

Revision	Date	Description
0	3/09/2012	Initial Issuance
1	7/12/2012	Revisions based on comments received from USEPA in a letter dated June 5, 2012 (“Comments on the Vapor Intrusion Assessment Work Plan”).
2	9/11/2012	Revisions based on comments received from USEPA in a memorandum dated July 23, 2012 (“CTS of Asheville – 2012 Vapor Intrusion QAPP - QAS Review Memorandum 7/23/2012”).
3	12/09/2013	Revisions based on comments received from USEPA in a letter dated November 25, 2013 (“Request for Revision of Vapor Intrusion Assessment Work Plan - CTS of Asheville, Inc. Superfund Site”).
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1.0 INTRODUCTION

On behalf of CTS Corporation, AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this Field Sampling and Analysis Plan (FSAP) for the CTS of Asheville, Inc. Superfund Site (Site) located in Asheville, Buncombe County, North Carolina. The activities described in this FSAP will be performed pursuant to the Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study between the United States Environmental Protection Agency (USEPA) Region 4 and CTS Corporation, effective January 26, 2012.

This FSAP presents the procedures and methods associated with the Vapor Intrusion Assessment Work Plan (VI Work Plan). This FSAP, in conjunction with the Quality Assurance Project Plan (QAPP), are included in the VI Work Plan and provide the framework upon which the Vapor Intrusion Assessment will be conducted.

2.0 SAMPLING OBJECTIVE

The objective of the Vapor Intrusion Assessment is to determine whether concentrations of Site-related volatile organic compounds (VOCs) are present in crawlspaces or indoor spaces at residences previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. Concentrations of detected analytes, if any, will be compared to risk-based screening values to indicate the potential for the occurrence of vapor intrusion to pose a risk to the residential receptors. As additional data is collected during implementation of the Remedial Investigation, the VI Work Plan might be modified to include additional sampling locations/events.

3.0 AIR SAMPLING APPROACH

Air sampling will be conducted at two residences adjacent to the Site previously assessed by USEPA and/or proximate to the currently known contaminated groundwater plume.

Crawlspace and indoor air samples will be collected at the following residences:

- [redacted]
- [redacted]

Access agreements have been obtained by USEPA allowing for access by the Respondent's representative(s) from the property owners. Property owners/tenants will be notified of the sampling activities by USEPA prior to beginning the sampling event. Air samples will be collected from the crawlspaces and indoor areas of the structures.

Four ambient air samples associated with the crawlspace/indoor air samples will also be collected. The locations of the ambient air samples will be dependent on the predominant wind direction at the time of sampling, and the proximity to previously identified surface waters containing Site-related VOCs.

The air samples (crawlspace, indoor and ambient) will be submitted for analysis of Site-related VOCs, as described in the VI Work Plan QAPP. The sampling activities are expected to take up to three days to complete. Quality assurance/quality control samples will be collected/submitted as described in the QAPP.

Sample collection activities will be documented in field logbooks and on field data record forms (FDRs). Use of logbooks is described in the QAPP. Examples of FDRs that are anticipated to be used during the sample collection are contained in Appendix C of the QAPP.

The samples will be submitted for analysis with a scheduled maximum turnaround time of 21 days from the laboratory's receipt of the samples. A Vapor Intrusion Assessment Report will be prepared and submitted to USEPA, along with draft transmittal letters to property owners with the respective sampling data.

4.0 SAMPLE DESIGNATION, HANDLING, AND ANALYSIS

Procedures for sample designation, handling, and analysis are included in the Vapor Intrusion Assessment Work Plan QAPP.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

The following data collection or sampling procedures are proposed for the air sampling activities:

- Data collection related to physical properties of structures
- Recording predominant direction of wind, barometric pressure, and temperature
- Deployment and retrieval of SUMMA® canisters for collection of air samples
- Surveying sample locations

5.1 COLLECTION OF PHYSICAL PROPERTIES OF STRUCTURES

Prior to collecting air samples, the interior of each residence will be surveyed to collect information about the structure (e.g., configuration, presence/absence of a vapor barrier, heating/cooling systems, etc.) and to assess factors that could influence the air sampling results (e.g., products or chemicals containing VOCs). An Occupied Dwelling Questionnaire, such as the one included in Appendix C of the VI Work Plan, will be completed in coordination with the occupant of the residence prior to initiating the air sampling activities.

Background indoor air sources of volatile chemicals in residential structures include consumer products, supplies used for personal hobbies, household cleaners, paints, and building supplies. These background sources will be attempted to be identified and removed from the residence prior to collection of crawlspace and indoor air samples.

The air in the vicinity of the location intended for sampling will be screened with a calibrated photoionization detector (PID) to assess the potential presence of VOCs. PID readings will be recorded on the Questionnaire.

5.2 RECORDING PREDOMINANT DIRECTION OF WIND

The predominant direction of wind at the sampling locations will be recorded on the FDR during deployment and retrieval of the air sampling equipment. The predominant direction of the wind will be determined based on visual observations in the area of the sampling location. Based on the topography of the area surrounding the Site, the predominant direction of the wind might be different at the individual sampling locations.

The Field Operations Leader will be notified if there is not a discernable predominant wind direction, and forecast information from weather agencies might be consulted to determine if weather patterns will produce a likely predominant wind direction during the air sampling equipment deployment period.

5.3 COLLECTION OF AIR SAMPLES

Air samples will be collected using individually-certified, 6-Liter, electropolished, stainless steel (SUMMA®) canisters equipped with flow regulators in accordance with the time integrated sample collection procedure for VOCs in USEPA Science and Ecosystem Support Division's (SESD's) Operating Procedure "Ambient Air Sampling," effective January 5, 2011. Air samples will not be collected during periods of rain or snow. Modifications to the sampling procedure will be documented in the field logbook. Clean, non-powdered, disposable gloves (e.g. nitrile) will be worn when deploying and collecting the canisters used for collecting the air samples. A new pair of gloves will be donned immediately prior to deploying and collecting the canisters.

5.3.1 Collection of Crawlspace Air Samples

Additional information on the procedure for the collection of the crawlspace air samples is as follows:

Selection and preparation of sample collection point:

- Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample.
- Record relevant information on the FDR.
- Using a calibrated PID, screen air in the vicinity of the sample collection location to assess the potential presence of VOCs. Record PID readings on the FDR.
- If PID readings are recorded, the Field Operations Leader will determine whether the sampling should proceed.

Preparation of 24-hour SUMMA® canister and collection of sample:

- Place SUMMA® canister on floor of crawlspace if possible. As an alternate, canister can be placed on a stable surface or affixed to a wall or floor support with nylon rope. Avoid placing canisters near windows or other potential sources of drafts and air supply vents.

- Record SUMMA® canister and flow controller identification numbers on FDR and chain-of-custody (COC).
- Record sample identification on canister identification tag, and record on FDR and COC.
- Remove brass plug from canister fitting.
- Install pressure gauge/flow controller on canister valve fitting and tighten. If pressure gauge has additional (second) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on FDR and COC. Remove brass plug from gauge fitting and store for later use.
- Open canister valve to initiate sample collection.
- Record air temperature, date and local time (24-hour basis) of valve opening on FDR and COC.
- Take digital photograph(s) of SUMMA® canister and surrounding area.

Termination of 24-hour sample collection:

- Revisit SUMMA® canister approximately at end of sample collection period (e.g., 24 hours after initiation of sample collection) and record gauge pressure on FDR and COC.
- Record air temperature, date and local time (24-hour basis) of valve closing on FDR and COC.
- Close canister valve.
- Remove pressure gauge and flow controller from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA® canister from sample collection area.

Preparation and shipment of sample to analytical laboratory:

- Pack SUMMA® canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

5.3.2 Collection of Indoor Air Samples

Additional information on the procedure for the collection of the indoor air samples is as follows:

Selection and preparation of indoor air sample collection point:

- Identify the areas that have the potential for frequent use.
- Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample.
- Record relevant information on the FDR.
- Using a calibrated PID, screen air in the vicinity of the sample collection location to assess the potential presence of VOCs. Record PID readings on the FDR.
- If PID readings are recorded, the Field Operations Leader will determine whether the sampling should proceed.

Preparation of 24-hour SUMMA® canister and collection of sample:

- Place SUMMA® canister on floor if possible. As an alternate, canister can be placed on a stable surface. Avoid placing canisters near windows or other potential sources of drafts and air supply vents. Sample intake should be approximately two to four feet above the floor.
- One sample should be collected from near the middle of the structure. If two samples are to be collected, then one of the sample locations should be the master bedroom or the bedroom of the youngest child.
- Record SUMMA® canister and flow controller identification numbers on FDR and COC.
- Record sample identification on canister identification tag, and record on FDR and COC.
- Remove brass plug from canister fitting.
- Install pressure gauge/flow controller on canister valve fitting and tighten. If pressure gauge has additional (second) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on FDR and COC.
- Remove brass plug from gauge fitting and store for later use.
- Open canister valve to initiate sample collection.
- Record air temperature, date and local time (24-hour basis) of valve opening on FDR and COC.
- Take digital photograph(s) of SUMMA® canister and surrounding area.

Termination of 24-hour sample collection:

- Revisit SUMMA® canister approximately at end of sample collection period (e.g., 24 hours after initiation of sample collection) and record gauge pressure on FDR and COC. Gauge pressure should read >1 and <10 inches of mercury (Hg).

- Record air temperature, equipment serial numbers, date and local time (24-hour basis) of valve closing on FDR and COC.
- Close canister valve.
- Remove pressure gauge and flow controller from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA® canister from sample collection area.

Preparation and shipment of sample to analytical laboratory:

- Pack SUMMA® canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

5.3.3 Collection of Ambient Air Samples

Ambient (outdoor) air samples will be collected in the vicinity of the residential structures. Two ambient air samples will be collected between a surface water feature containing Site-related VOCs and the adjacent residence(s) where a crawlspace/indoor air sample is collected (see Figure 2 of VI Work Plan). Additional information on the procedure for the collection of the ambient air samples is as follows:

Selection and preparation of ambient sample collection area:

- Choose an area for sample collection that is upwind of the residence(s) being assessed, if possible. Collect sample away from wind breaks, if possible.
- For locations between a residence and a surface water feature identified as having concentrations of Site-related VOCs, choose a location approximately one-half the distance between the residential structure and the surface water feature (see Figure 2 of the VI Work Plan).
- Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample.
- Record relevant information on FDR.
- Using a calibrated PID, screen ambient air in the location intended for sampling to assess the potential presence of VOCs. Record PID readings on the FDR.

Preparation of SUMMA® canister and collection of ambient air sample

- Place SUMMA® canister on a stable surface or suspended from a structure/tree with nylon rope, with the sample intake at a height of three to five feet above the ground.
- Record SUMMA® canister and flow controller identification numbers on FDR and COC.
- Record sample identification on canister identification tag, and record on FDR and COC.
- Remove brass plug from canister fitting.
- Install pressure gauge/flow controller on canister valve fitting and tighten. If pressure gauge has additional (second) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on FDR and COC. Remove brass plug from gauge fitting and store for later use.
- Open canister valve to initiate sample collection.
- Record air temperature, date and local time (24-hour basis) of valve opening on FDR and COC.
- Take digital photograph(s) of SUMMA® canister and surrounding area.

Termination of ambient sample collection

- Revisit SUMMA® canister approximately at end of sample collection period (e.g., 24 hours after initiation of sample collection) and record gauge pressure on FDR and COC.
- Record air temperature, date and local time (24-hour basis) of valve closing on FDR and COC.
- Close canister valve.
- Remove pressure gauge/flow controller from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA® canister from sample collection area.

Preparation and shipment of sample to analytical laboratory

- Pack SUMMA® canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

5.3.4 Collection of Quality Assurance/Quality Control Samples

The collection of quality assurance/quality control samples, as described in the QAPP, will include the submittal of field duplicate and trip blank samples to the analytical laboratory for analyses of Site-related VOCs. Duplicate samples will be collected using two SUMMA® canisters connected with a stainless steel "tee" fitting to produce one air inlet.

5.4 SURVEYING

The coordinates and location descriptions of previously collected air samples are contained in reports provided by USEPA. If a sampling location is modified (i.e., the sample has to be collected from a different location in the structure), the modified location will be noted in the field log book and will be surveyed as described below. Ambient air sampling locations and new air sampling locations will be surveyed as described below.

Sampling locations will be surveyed using a Trimble® Global Positioning System (GPS) or similar instrument. As specified in SESD Operating Procedure "Global Positioning System," effective date April 20, 2011, sample locations will be located with three meter accuracy. If a location is in an area where a GPS signal cannot be received (e.g. areas with tree canopy or inside the structure), the GPS locations will be located from the nearest point where a signal is received and deviations will be noted in the field book.

6.0 DECONTAMINATION PROCEDURES

Field equipment requiring decontamination will not be employed during implementation of the Vapor Intrusion Assessment. Air canisters, and associated flow controllers and pressure gauges, will be individually cleaned and certified by the laboratory prior to use.

7.0 MANAGEMENT OF INVESTIGATION DERIVED WASTE

The procedures associated with the management of investigative derived waste (IDW) have been developed in accordance with the SESD Operating Procedure "Management of Investigation Derived Waste," effective October 15, 2010. IDW that will potentially be generated during implementation of the air sampling program include personal protective equipment and disposable items. The IDW to be generated during implementation of the

air sampling is expected to be relatively free of contamination. IDW will be placed in trash bags and disposed of in a municipal solid waste dumpster.

8.0 REFERENCES

USEPA, 2010. Management of Investigation Derived Waste, Science and Ecosystem Support Division, Athens, GA; SESDPROC-202-R2, October 15, 2010.

USEPA, 2011. Ambient Air Sampling, Science and Ecosystem Support Division, Athens, GA; SESDPROC-303-R4, January 5, 2011.

USEPA, 2011. Global Positioning System, Science and Ecosystem Support Division, Athens, GA; SESDPROC-110-R3, April 20, 2011.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

VAPOR INTRUSION ASSESSMENT WORK PLAN: QUALITY ASSURANCE PROJECT PLAN (REVISION 4)

CTS OF ASHEVILLE, INC. SUPERFUND SITE

235 Mills Gap Road
Asheville, Buncombe County, North Carolina
EPA ID: NCD003149556
CERCLA Docket No. CERCLA-04-2012-3762

Prepared for:

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AMEC Project 6252-12-0006

March 14, 2014

Vapor Intrusion Assessment Work Plan:
Quality Assurance and Project Plan (Revision 4)

CTS of Asheville, Inc. Superfund Site
235 Mills Gap Road
Asheville, Buncombe County, North Carolina
EPA ID: NCD003149556
CERCLA Docket No. CERCLA-04-2012-3762

Prepared For: CTS Corporation
Prepared by: AMEC Environment & Infrastructure, Inc.

March 14, 2014

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B ALS Environmental Quality Assurance Manual
C Example Field Data Records
D ALS Environmental Standard Operating Procedure for Cleaning and Certification of SUMMA Canisters and Other Specially-Prepared Canisters
E ALS Environmental Standard Operating Procedure for Evaluation and Pressurization of Specially Prepared Stainless Steel Canisters
F ALS Environmental Standard Operating Procedure for Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags by Gas Chromatography/ Mass Spectrometry (GC/MS)

LIST OF ACRONYMS

AMEC	AMEC Environment & Infrastructure, Inc.
COC	chain-of-custody
DQO	data quality objective
EDD	electronic data deliverable
FDR	field data record
FOL	Field Operations Leader
FSAP	Field Sampling and Analysis Plan
GSL	Generic Screening Level
HASP	Health and Safety Plan
LCS	laboratory control sample
LD	laboratory duplicate
MDL	method detection limit
OSHA	Occupational Safety and Health Act
PQL	practical quantitation limit
PM	Project Manager
QA/QC	quality assurance/quality control
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
RPD	relative percent difference
RSL	Regional Screening Level
SDG	sample delivery group
SIM	selective ion monitoring
TED	Technical Environmental Database
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

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DOCUMENT REVISION LOG

Revision	Date	Description
0	3/09/2012	Initial Issuance
1	7/12/2012	Revisions based on comments received from USEPA in a letter dated June 5, 2012 (“Comments on the Vapor Intrusion Assessment Work Plan”).
2	9/11/2012	Revisions based on comments received from USEPA in a memorandum dated July 23, 2012 (“CTS of Asheville – 2012 Vapor Intrusion QAPP - QAS Review Memorandum 7/23/2012”).
3	12/09/2013	Revisions based on comments received from USEPA in a letter dated November 25, 2013 (“Request for Revision of Vapor Intrusion Assessment Work Plan - CTS of Asheville, Inc. Superfund Site”).
4	3/14/2014	Revisions based on comments received from USEPA in a letter dated February 28, 2014 (“Comments on the Vapor Intrusion Assessment Work Plan (Revision 3) - CTS of Asheville, Inc. Superfund Site”).

1.0 INTRODUCTION

On behalf of CTS Corporation (CTS), AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this Quality Assurance Project Plan (QAPP) for the CTS of Asheville, Inc. Superfund Site (Site) located in Asheville, Buncombe County, North Carolina. The activities described in this QAPP will be performed pursuant to the Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study between the United States Environmental Protection Agency (USEPA) Region 4 and CTS Corporation, effective January 26, 2012 (Settlement Agreement).

This QAPP has been designed to be a project document that is applicable to the evaluation of vapor intrusion. This QAPP, in conjunction with the Field Sampling and Analysis Plan (FSAP), are included in the Vapor Intrusion Assessment (VI Work Plan) and provide the framework upon which the sampling activities will be conducted. The QAPP has been prepared to document how the sampling activities will be completed and includes investigation procedures, sampling methods, analytical methods, sample management, documentation procedures and quality assurance (QA) review procedures.

2.0 PROJECT MANAGEMENT

This section provides the overall approach to manage activities described in the VI Work Plan and includes the following:

- Project organization and responsibilities
- Problem definition
- Project description
- Data quality objectives
- Method performance objectives
- Special training, requirements, and certification
- Documentation and records management

2.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

The various responsibilities of key project personnel are presented in this section and a project organizational chart is presented in Appendix A.

2.1.1 AMEC Environment & Infrastructure, Inc.

AMEC will execute the Vapor Intrusion Assessment from its Asheville, North Carolina office with support from other AMEC offices. Project personnel and duties are described in the following sections.

2.1.1.1 Project Manager

The Project Manager, Mr. Matthew Wallace, PE (North Carolina), will be responsible for the scope, cost, and technical considerations related to the project; staff and project coordination; and implementation of review of overall project quality related to the collection, completeness, and presentation of data. The Project Manager oversees the technical work conducted by the Field Operations Leader, quality assurance activities by the Quality Assurance Manager, and health and safety activities by the Site Health and Safety Supervisor.

2.1.1.2 Field Operations Leader

The Field Operations Leader (FOL), Ms. Susan Kelly, LG, PE (North Carolina), will be responsible for executing the planned work elements, issuing specific instructions for

performing assigned work elements, and performing and directing the work so it is conducted in compliance with project-specific objectives and applicable QA procedures. The FOL will coordinate with the Project Manager and Quality Assurance Manager to review general work plans and specific work elements. The FOL maintains field documentation and deliverables in the project files during the performance of the assigned tasks. For field sampling activities, the FOL will be responsible for performing and/or overseeing the field work, preparing proper documentation, and ensuring proper handling of samples from sampling activities. The FOL has the authority to issue a stop work order if field sampling operations are not being conducted in accordance with the requirements specified in the Work Plan/FSAP/QAPP or when worker safety becomes an issue.

2.1.1.3 Quality Assurance Manager

The Quality Assurance Manager, Mr. Christian Ricardi, NRCC-EAC of AMEC's Portland, Maine office, will be responsible for reviewing the project QA program as it relates to the collection and completeness of data from field and laboratory operations. Mr. Ricardi's primary responsibilities include review of quality assurance/quality control (QA/QC) protocols, ascertaining quality of environmental data collected to verify that it meets proposed data quality objectives, and identifying and verifying corrective actions, if any become necessary.

2.1.1.4 Project Chemist

A Project Chemist will responsible for reviewing laboratory reports for accuracy and completeness, performing data validation using general procedures described in USEPA Region 4's Data Validation Standard Operating Procedures for Organic Analysis (USEPA, 2008) modified for evaluation of USEPA Method TO-15/TO-15 SIM (selective ion monitoring). The Project Chemist will submit the validated laboratory reports with QA/QC Evaluation Sheets to the Quality Assurance Manager.

2.1.1.5 Site Health and Safety Supervisor

The Site Health and Safety Supervisor, Ms. Susan Kelly, LG, PE, is responsible for developing, implementing, and updating the Site Health and Safety Plan (HASP) to be consistent with anticipated conditions that may be encountered during field operations. Ms. Kelly will also serve as the FOL during implementation of the VI Work Plan.

2.1.2 Analytical Laboratory

Laboratory analyses will be performed by ALS Environmental of Simi Valley, California. Personnel organization, responsibility, and training for the laboratory can be found in ALS Environmental's Quality Assurance Manual (QAM), which is included in Appendix B.

2.2 PROJECT DESCRIPTION

The project involves collecting air samples from crawlspaces and indoor locations at residences previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. Ambient air samples will also be collected to evaluate ambient outdoor air quality conditions. The collected air samples, and associated QA/QC samples will be submitted for analysis of Site-related VOCs, according to USEPA Method TO-15 SIM. Concentrations of detected constituents, if any, will be compared to risk-based screening values to indicate the potential for the occurrence of vapor intrusion to pose a potential risk to the residential receptors. As additional data is collected during implementation of the Remedial Investigation, the VI Work Plan might be modified to include additional sampling locations/events.

2.3 DATA QUALITY OBJECTIVES

Data collected at a site needs to be of sufficient quality and quantity to support defensible decision making. Data quality objectives (DQOs) are identified before the sampling and analysis begin. DQOs will be used to ascertain the type, quality, and quantity of data necessary to address problems. The USEPA guidance document, Guidance on Systematic Planning Using the Data Quality Objectives Process (USEPA, 2006), outlines the following seven-step process for establishing DQOs:

1. **State the Problem.** Concisely describe the problem to be studied.
2. **Identify the Goal of the Study.** State how environmental data will be used in meeting objectives and solving the problem, identify study questions, and define alternative outcomes.
3. **Identify Information Inputs.** Identify data and information needed to answer study questions.
4. **Define the Study Boundaries.** Specify the conditions (time periods, spatial areas, and situations) to which the decision will apply and within which the data will be collected.

5. **Develop the Analytical Approach.** Define the conditions by which the decision maker will choose among alternative risk management actions. This is usually specified in the form of an "if…then…" statement.
6. **Specify Performance or Acceptance Criteria.** Define in statistical terms the decision maker's acceptable error rate based on the consequence of making an incorrect decision.
7. **Develop the Plan for Obtaining Data.** Evaluate the results of the previous steps and develop the most resource-efficient design for data collection that meets all of the DQOs.

2.3.1 State the Problem

Soil and groundwater contamination has been identified at the CTS of Asheville, Inc. Superfund Site. The VOC groundwater plume extends beyond the Site boundaries and is in the vicinity of residential dwellings. Groundwater discharges at springs located east and west of the Site. VOCs might pose a risk to nearby residential receptors via the inhalation of vapors emanating from the groundwater plume and/or the springs/surface waters adjacent to the Site.

2.3.2 Identify the Goals of the Study

The principal study question the Vapor Intrusion Assessment addresses is:

- Do Site-related contaminants detected in the crawlspace and/or indoor air samples, if any, indicate the potential for the occurrence of vapor intrusion to pose a potential risk to the residential receptors?

Alternative actions include:

- Take no action.
- Resample the crawlspace, indoor and/or ambient air.
- Collect additional indoor air samples.
- Mitigate or reduce the source of the air contamination.
- Remove occupant(s) from residence.

2.3.3 Identify Information Inputs

The primary information input needed to support the decision making process will be the results of analyses performed on the collected air samples, as well as the environmental conditions present during sample collection. Prior to collecting air samples, the interior of each residence will be observed to collect information about the structure (e.g., configuration, presence/absence of a vapor barrier, heating/cooling systems, etc.) and to

document factors that could influence the air sampling results (e.g., products or chemicals containing VOCs). An Occupied Dwelling Questionnaire, such as the one included in Appendix C of the VI Work Plan, will be completed in coordination with the occupant of the residence prior to initiating the air sampling activities. Two crawlspace and two indoor air samples will be collected.

Four ambient air samples will be collected to determine if there are anthropogenic sources of contamination in the area where the crawlspace and indoor air samples will be collected. The results of the ambient air samples will be compared to the crawlspace and indoor air sample results where VOCs are detected to evaluate whether the crawlspace and/or indoor air sample results are the result of anthropogenic source(s) or from subsurface vapor intrusion.

Two of the ambient air samples will be collected at the locations depicted in Figure 2 of the VI Work Plan. The two pre-determined ambient air sample locations are approximately half of the distance between the nearest residence in an area of one to three residences where crawlspace and indoor air samples will be collected and a surface water feature (e.g., spring or creek) where Site-related VOCs have been detected. The other two ambient air samples will be collected upwind of the area of each of the residences where crawlspace samples will be collected. The predominant wind direction will be determined so that placement of two ambient air sample canisters can be established. Two ambient air samples will be collected upwind of the structures where crawlspace air samples are collected, as described in Section 5.3.2 of the FSAP.

Meteorological data will be collected to document the weather conditions during the time period when the samples are collected. Meteorological data, including wind speed and direction, temperature, and barometric pressure, will be obtained from the State Climate Office of North Carolina website (Climate Retrieval and Observations Network of the Southeast Database) that publishes hourly meteorological data measured at the Asheville Regional Airport. The Asheville Regional Airport is located approximately 4.5 miles southwest of the Site.

The air samples will be submitted for Site-related VOCs according to USEPA Method TO-15 SIM. The Site-related VOCs include trichloroethene and its breakdown/daughter compounds, as follows:

- trichloroethene
- cis-1,2-dichloroethene
- trans-1,2-dichloroethene
- vinyl chloride

Performance and acceptance criteria are described in Section 2.4 of the QAPP.

2.3.4 Define the Study Boundaries

The target populations for the study include:

- Two air samples collected in residential crawlspaces and indoor air locations (population is the 6 Liters of air collected at each location by the sampling container over a 24-hour period of time)
- Four ambient air samples collected (population is the 6 Liters of air collected at each location by the sampling container over a 24-hour period of time)

Samples will be collected from the crawlspaces at residences previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. Sample locations are depicted in Figure 2 of the VI Work Plan. Samples will be collected from those residences where permission to collect air samples is granted by the owner of the residence. Ambient (outdoor) air samples associated with the crawlspace air samples will also be collected.

The air samples will be collected in SUMMA® canisters over a 24-hour period. The sampling activities are expected to take up to three days to complete.

Practical constraints that might interfere with the investigation include:

- Access to sampling location is not granted from property owner
- Physical limitations to the proposed sampling location (i.e., sampling personnel cannot physically enter crawlspace)
- Weather (air samples will not be collected during rain or snow conditions)
- Vegetation (restricting deployment of ambient air samples)

The smallest unit on which decisions will be made are the analytical results of individual air samples.

2.3.5 Develop the Analytic Approach

The analytical results of constituents detected in the crawlspace and indoor air samples, if any, will be compared to their associated USEPA Regional Screening Level (RSL) and/or Generic Screening Level (GSL) for indoor air. For screening purposes, the analytical results of the indoor air samples will be compared to the most current residential air RSL. If crawlspace air samples are collected without a corresponding indoor air sample, the RSLs will be divided by a crawlspace to indoor air attenuation factor of 0.53 for evaluation of the results. USEPA Method TO-15 SIM has quantitation limits that are less than the RSLs and/or GSLs, where established, so that potential contaminants can be detected if they are present at concentrations greater than their associated RSL/GSL (Table 1).

2.3.6 Specify Performance or Acceptance Criteria

Data is subject to random and systematic errors at different stages of the collection process and typically include the following components:

- Sampling Error: Sometimes called Statistical Sampling Error, is influenced by the inherent variability of the population over space and time, the sample collection design, and the number of samples taken. It is usually impractical to measure the entire population space, and limited sampling may miss some features of the natural variation of the measurement of interest. Sampling design error occurs when the data collection design does not capture the complete variability within the population space, to the extent appropriate for making conclusions. Sampling error can lead to random error (i.e., random variability or imprecision) and systematic error (bias) in estimates of population parameters.
- Measurement Error: Sometimes called Physical Sampling Error, is influenced by imperfections in the measurement and analytical system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, data reduction, transmission, and storage.

The vapor intrusion assessment is a systematic study of individual locations and assessment of statistical error is not planned. Measurement error is addressed by establishing standardized methods of sample collection and through the validation of analytical data.

Data from off-Site laboratory analysis will be reviewed and validated as described in Section 5.0. Results will be evaluated based on criteria in the referenced analytical method and USEPA validation guidelines. Results may be accepted without qualification or with validation qualifiers (e.g., J, UJ). Results that don't meet minimum criteria for acceptance (i.e., qualified as rejected during validation) will be unacceptable for decision making purposes. Project quality goals (i.e., acceptance criteria) are presented in Table 2.

2.3.7 Develop the Plan for Obtaining Data

A systematic/judgmental sampling design will be implemented, as crawlspace, indoor and ambient air samples will be collected from properties that have been previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. Prior to collecting the air samples, the interior of each residence will be surveyed to collect information about the structure (e.g., configuration, presence/absence of a vapor barrier, heating/cooling systems, etc.) and to assess factors that could influence the air sampling results (e.g., products or chemicals containing VOCs). Prior to collecting the air samples, the interior of each residence will be surveyed to collect information about the structure (e.g., configuration, presence/absence of a vapor barrier, heating/cooling systems, etc.) and to assess factors that could influence the air sampling results (e.g., products or chemicals containing VOCs). The following steps are included to obtain data:

- Identify sample locations and obtain permission to collect sample.
- Survey sample locations and remove potential indoor sources.
- Collect samples for laboratory analysis.
- Obtain analytical results from laboratory and complete data validation.
- Compare results to project objectives identified in Section 2.3.2.
- Complete actions for individual locations based on analytical data.

2.4 METHOD PERFORMANCE OBJECTIVES

Performance objectives are defined for field data and fixed laboratory data. Method performance objectives for work performed are expressed in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Target analytes and detection limits are summarized in Table 1. Project QA/QC acceptance criteria for air

samples are summarized in Table 2. The following sections describe the method performance parameters and calculations, as appropriate.

2.4.1 Precision

Precision is described as the agreement among a set of duplicate or replicate measurements. Precision is measured using relative percent difference (RPD) for two data points, as follows:

$$RPD = \frac{|X_1 - X_2| x100}{(X_1 + X_2)/2}$$

where: RPD = relative percent difference between duplicate results
X_1 and X_2 = results of original sample and duplicate analyses
$|X_1 - X_2|$ = absolute difference between duplicates X_1 and X_2

2.4.1.1 Field Precision

Field precision is assessed through the collection and measurement of field duplicates (one extra sample in addition to the original field sample). Field duplicates will be collected at a frequency of one per ten investigative samples. Precision will be measured through the calculation of RPD. The resulting information will be used to assess sample homogeneity, spatial variability of samples, sample collection reproducibility, and analytical variability. The field precision goal is a RPD less than 50 percent.

2.4.1.2 Laboratory Precision

The precision of the analysis can be inferred through laboratory duplicate samples. The laboratory analyzes one or more of these duplicate samples at a rate of one per 20 samples. The precision of laboratory analyses will be assessed by calculating the RPD for each pair of laboratory duplicate samples. The laboratory precision goal is a RPD less than 25 percent.

2.4.2 Accuracy

Accuracy is the degree of agreement between a measurement or observation and an accepted value.

2.4.2.1 Field Accuracy

Field accuracy will be achieved by adhering to sampling, handling, preservation, and holding time requirements. Trip blanks will be used to assess the potential for contamination of samples due to migration of contaminants (e.g., VOCs) during sample shipment, handling, and/or storage.

2.4.2.2 Laboratory Accuracy

Laboratory accuracy is assessed by analyzing laboratory control samples (LCS). The results are expressed as a percent recovery. Surrogate recoveries may also be used to assess accuracy. Method blanks will be used to assess possible contamination from laboratory procedures. LCSs and method blanks will be analyzed at least once with each analytical batch, with a minimum of one for every 20 samples. The percent recovery (% recovery) is calculated with the following equation:

$$\%\ recovery = \left(\frac{X - B}{T} \right) x\ 100$$

where: X = measured amount in sample after spiking
B = background amount in sample
T = amount of spike added

The laboratory accuracy acceptance criteria are presented in Table 2.

2.4.3 Representativeness

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is demonstrated in the project planning documents by providing full descriptions of the sampling techniques and the rationale used for selecting sampling locations. Representativeness is reassessed during the data usability process.

A 24-hour sample collection time will be used to obtain samples that are representative of daily conditions (i.e., the sample canisters will be deployed for a 24-hour period). Prior to deployment of the sample canisters, the air in the vicinity of the location intended for sampling will be screened with a calibrated photoionization detector (PID) to assess the potential presence of VOCs. The presence of elevated VOC concentrations from other

sources (i.e., not from vapor intrusion) could result in the collected sample to be diluted, which would adversely affect the analytical results of the sample (i.e., actual VOC concentrations might be too diluted to be detected by the analytical measurement equipment). If VOCs are detected by the PID, an alternate sample location will be identified where VOCs are not indicated by the PID.

2.4.4 Completeness

Completeness is a measure of the quantity of valid data obtained from a measurement system compared to the quantity that was planned under normal conditions. Percent completeness is calculated with the following equation:

$$\% \text{ Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100$$

Valid analytical results used to meet completeness objectives are those results that provide defensible estimates of the true concentration of an analyte in a sample. These valid results include data that is not qualified and data for which QC results indicate qualification is necessary but which may still be used to meet project objectives. Invalid results are those data for which there is an indication that the prescribed sampling or analytical protocol was not followed.

The goal of the Vapor Intrusion Assessment is to obtain field samples and usable laboratory data from residential structures identified in the VI Work Plan that have granted access for sampling. After the completion of the sampling activities, an assessment of sampling completeness will be performed to identify residences where samples were not obtained, if any. A second evaluation of completeness will be done upon completion of data validation to determine if usable data were obtained from the laboratory for the collected samples. If usable data for the Site-related VOCs are not obtained from each sampled location, an evaluation will be conducted to determine the impact of missing data on the assessment of potential contamination at the missing locations. Recollection of samples might be necessary, as determined after assessment of available data from other sample locations. A completeness goal of 100 percent is proposed for this project.

2.4.5 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Throughout sampling on this project, standard methodologies as discussed in the FSAP and in this QAPP will be used for both sampling and analysis activities to ensure comparability. The intention is to use the same laboratory (ALS Environmental) for standard analyses and there should not be a need to assess the comparability of data from different laboratories.

2.4.6 Sensitivity

Sensitivity is the capability of a test method or instrument to quantify sample results at levels consistent with the project objectives. The analytical method selected for this investigation will provide detection limits sufficient to determine the presence or absence of contamination in air samples at low levels. Although there is not a single definition of this term, the following terms and definition of detection limits will be used:

- Method detection limit (MDL) is a statistically determined concentration. It is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero as determined in the same or a similar matrix. Because of the uncertainty of accuracy and precision in this range, sample results greater than the MDL but less than the practical quantitation limit will be reported as estimated and flagged with a "J."
- Practical quantitation limit (PQL) is the concentration of the target analyte that the laboratory has demonstrated the ability to measure within specified limits of precision and accuracy during routine laboratory operating conditions. This value is variable and highly matrix-dependent. It is the minimum concentration that the laboratory will report as unqualified.

Laboratory method detection and practical quantification limits are presented in Table 1. The laboratory PQLs and MDLs were compared to applicable RSLs and GSLs, where established, for the constituents analyzed. With the exception of trichloroethene (TCE), the PQLs are less than the associated RSLs and/or GSLs, where established (i.e., a RSL has not been established for cis-1,2-dichloroethene). The PQL for TCE is 0.025 micrograms per cubic meter ($\mu g/m^3$) and the GSL is 0.022 $\mu g/m^3$; however, the MDL for TCE is 0.0067 $\mu g/m^3$, so an estimated concentration of TCE can be determined if TCE is present in an air sample.

2.5 SPECIAL TRAINING/CERTIFICATION

Training of field personnel will be provided by the FOL. Routine training will be completed at the beginning of each field event if required. The FOL will review applicable procedures with each field personnel to verify that the project requirements and procedures are understood and implemented properly. Field personnel will review and follow manufacturer's operating procedures for field equipment, such as the PID.

Personnel conducting work at the Site will be appropriately trained in health and safety procedures. If appropriate, personnel conducting work covered by this QAPP will have obtained at a minimum, the 40-hour hazardous waste-site worker training program and the 8-hour annual refresher course in compliance with regulations stated in 29 CFR Part 1910.120. Certificates or documentation representing completion of training will be maintained in personnel files. The Project Manager or FOL will verify that personnel have the necessary training and certifications prior to the implementation of the project.

A Site HASP has been developed specific to the Site activities discussed in this QAPP. The HASP applies to AMEC employees and AMEC subcontractors, only. Personnel implementing the air sampling activities will be required to read, understand, and conform to the requirements of the HASP. If new information arises, the HASP will be updated, as necessary, to ensure compliance with the Occupational Safety and Health Act (OSHA) and safe working conditions.

2.6 DOCUMENTS AND RECORDS

Critical records for the work will be maintained in AMEC's Asheville, North Carolina, office. File maintenance will be under the direct control of the Project Manager. Project records will be organized with a project-specific file and document numbering system in accordance with AMEC protocols.

The anticipated project records include:

- Project log book(s)
- Field data records (FDRs)
- Safety records, as specified in the Site HASP

- Chain of custody records
- Laboratory reports

The hard copy records will be stored in AMEC's Asheville, North Carolina office.

The anticipated electronic records include:

- Laboratory electronic data deliverables (EDDs)
- Final validated laboratory analytical results
- Meteorological data obtained from internet sources
- Survey data
- Photographs (digital)
- Scanned hard copy information (e.g., log books, FDRs, etc.)

The electronic records will be stored on AMEC's Asheville, North Carolina office server, which is backed up daily. Electronic data will be available to other AMEC office servers, as necessary for data validation, presentation, etc.; however, the original data documents will be stored on the Asheville server.

The off-Site laboratory (ALS Environmental) will submit analytical results in hard copy and electronic formats. The electronic data will be submitted as EDDs in accordance with the format described in Table 3. The analytical results will be imported into the AMEC Technical Environmental Database (TED). The TED is an Oracle-based relational database designed with using Microsoft structured query language. The TED is used to manage and store a variety of records generated during field investigations, including sample location information and analytical data. The TED can provide output files, such as Excel, for use in data validation and subsequent importation of data qualification actions. A variety of data output formats are available including sample results summary tables, summaries of data qualification actions, trend analysis for long term monitoring programs, and queries used to generate figures and tables in contamination and risk assessments. The TED data are permanently stored on a secure AMEC server that is backed up daily.

The primary documents to be produced for the project are the Vapor Intrusion Assessment Report and the draft transmittal letters. The Vapor Intrusion Assessment Report will include:

- A description of the work performed, including sampling and laboratory procedures
- An evaluation of the analytical results with respect to the RSLs and GSLs
- A screening-level assessment of potential human health risk associated with detected analytes in the air samples
- A map depicting the sampling locations
- A table summarizing the analytical results of the samples
- A data validation summary with associated documentation and the laboratory analytical results

The draft transmittal letters will be prepared in accordance with "Communicating Environmental Data to Property Owners and Tenants" (USEPA, 2010).

If this QAPP, or the associated VI Work Plan or FSAP, is updated/modified, the updated version(s) will be distributed to those persons identified in the distribution list. If the modifications are minor, then only the portions of the document with the modifications will be disturbed; otherwise, the entire document(s) will be distributed.

Retention of files will be in accordance with the Settlement Agreement, which requires the preservation and retention of records and documents during the pendency of the Settlement Agreement and for a minimum of fifteen years after completion of construction of any remedial action.

3.0 MEASUREMENT AND DATA ACQUISITION

The following sections describe the design and implementation of measurement procedures and discuss the methods to be used for sampling, analysis, data handling, and QC in support of the tasks performed.

3.1 SAMPLING PROCESS DESIGN

The VI Work Plan describes the proposed sampling plan, including planned sampling locations, rational for the sampling locations, and measurement methods. Procedures for air sampling, surveying, decontamination, and management of investigation derived waste are described in the FSAP.

Samples will be collected from the crawlspaces at residences previously assessed by USEPA that are contiguous to the Site and/or proximate to the currently known contaminated groundwater plume. Samples will be collected from those residences where permission to collect air samples is granted by the owner of the residence. Ambient air samples associated with the crawlspace air samples will also be collected. The air samples will be collected in 6-Liter SUMMA® canisters over a 24-hour period and submitted for analysis of Site-related VOCs according to USEPA Method TO-15 SIM.

3.1.1 Sampling Method

The sampling method for the collection of crawlspace and ambient air samples is described in Section 5.3 of the FSAP.

Field equipment for the project includes:

- A PID for detecting potential VOCs in the area of the sampling activities
- SUMMA® canisters
- Pressure gauges for SUMMA® canisters
- Flow controllers for SUMMA® canisters

Field supplies for the project include:

- FDRs and log books
- Personal protective equipment (e.g., nitrile gloves)
- Measuring tapes (engineers scale)

- Shipping containers (cardboard boxes)
- Packing tape
- Black ink pens
- Digital camera
- Calibration gases (supplied with rented equipment)

Support supplies/equipment include:

- Vehicles for personnel and sample transport
- Supplies to deploy air canisters, if needed

3.1.2 Field Sampling Documentation

Documentation of field activities will be completed using a combination of logbooks, FDRs, and sample custody records. Field logbooks will be completed to provide a general record of activities and events that occur during each field task. FDRs have been designed for exploration or sample collection tasks, to provide a complete record of data obtained during the activity. Examples of FDRs that will be used during the air sampling activities are included as Appendix C.

Deviations from the procedures specified in the QAPP and the FSAP will be documented in the field logbook and applicable FDRs. Such deviations may be dictated by Site-specific conditions encountered during the sampling activity.

3.1.2.1 Field Logbooks

The field logbook provides a daily hand written account of all field activities. Logbooks will be permanently bound and entries will be made in permanent black or blue ink, and corrections will be made with a single line with the author's initials and date. Each page of the logbook will be dated and signed by the person completing the log. Partially completed pages will have a line drawn through the unused portion at the end of each day. The following information will generally be entered into the field logbook during implementation of the Vapor Intrusion Assessment:

- Project name and number
- Date and time of each entry
- Weather conditions anticipated for the day, or as weather conditions change

- Site personnel and their responsibilities
- Descriptions of important tasks or subtasks
- A description of samples collected (if not documented on a FDR)
- A summary of problems encountered during the day, including cause of problem and corrective actions implemented, if appropriate

3.1.2.2 Field Data Records

Field data records contain sample collection and/or exploration details. Examples of FDR forms anticipated to be used during implementation of the Work Plan are contained in Appendix C. FDRs will be completed in the field by field personnel at the time testing/sampling is done. The goal of the FDR is to document exploration and sample collection methods, materials, dates and times, and sample locations and identifiers. Field measurements and observations associated with a given exploration or sample collection task will be recorded on the FDR. FDRs will be maintained throughout the field program in files that become a permanent record of field program activities. FDRs anticipated for the Vapor Intrusion Assessment include Photograph Logs and Air Sampling Records.

3.2 SAMPLE HANDLING AND CUSTODY

The following sections describe how samples will be identified, contained, packaged, transported, and tracked during sampling and analysis activities. The FOL will maintain the field logbook and will be responsible for sample custody in the field.

3.2.1 Sample Designation

Samples will be designated on the basis of sample type (e.g., field sample or QA/QC sample) and associated location, if applicable. Sample identification numbers will be assigned to the sampling locations in a sequential manner, beginning with “-01”. The sample identification number will remain the same for a particular sampling location throughout the duration of the Remedial Investigation, if additional samples are collected at the same location at a later time.

Field samples will be designated with the air sample type (i.e., crawlspace or ambient) and the predetermined location identification number. Crawlspace air samples will be identified as “CAS”, indoor air samples will be identified as “IAS”, and ambient air samples will be identified as “AAS.”

The QC samples will be cross-referenced on the sample FDRs or in the field logbook. The QC samples will have a prefix identifying their purpose, followed by the sequential number, as follows:

- FD-01 (field duplicate)
- TB-01 (trip blank)

Each sample submitted for analysis at the laboratory will be identified with a unique identification number (sample ID). These sample ID will be tracked from collection through laboratory analysis and into the final reports. The sample IDs will be recorded on a FDR during the sampling activities. The sample information will be recorded on FDRs or in the field logbook with sample designation information while in the custody of the sampling team. A sample label, or a tag, will be completed and attached to each sample container for every sample collected. Labels will be completed using an ink pen, and will contain at least the following information:

- Project name or number
- Date and time of sample collection
- Sample identification number
- Sampler's initials
- Analysis to be conducted

3.2.2 Sample Collection and Preservation

Air samples will be collected using 6-Liter SUMMA® canisters supplied by the laboratory. The canisters will be individually cleaned and leak checked by the laboratory. ALS Environmental's standard operating procedures related to cleaning and pressurizing the SUMMA® are included as Appendix D ("Standard Operating Procedure for Cleaning and Certification of SUMMA Canisters and Other Specially-Prepared Canisters") and Appendix E ("Standard Operating Procedure for Evaluation and Pressurization of Specially Prepared Stainless Steel Canisters"). Flow controllers and vacuum gauges will also be supplied by the laboratory. The flow controller will be adjusted by the laboratory so that the canisters will collected a sample over a 24-hour period under vacuum. The samples will be submitted for Site-related VOCs according to USEPA Method TO-15 SIM, which

has a holding time of 30 days. Sampling procedures are described in Section 5.3 of the FSAP.

3.2.3 Sample Packaging and Shipment

Sample containers will be placed in a shipping container for shipment to the laboratory. Custody seals, which are preprinted, adhesive-backed seals designed to break if disturbed, will be placed on the shipping container prior to shipment to provide security. The custody seals will be signed and dated before leaving AMEC's possession. Upon receipt by the laboratory, the sample custodian will confirm that the custody seals are intact or notify the Project Manager or FOL if custody seals have been broken.

Regulations for packaging, marking/labeling and shipping hazardous waste materials and waste are issued by U.S. Department of Transportation (USDOT). Air carriers which transport hazardous material, such as Federal Express, may also require compliance with the current edition of the International Air Transport Association (IATA) Dangerous Goods Regulations. Current IATA Regulations will ensure compliance with USDOT protocol.

3.2.4 Chain-of-Custody Records

The chain-of-custody (COC) record will be placed inside the shipping container. An example of the ALS Environmental's COC is on page 27 (Figure 6-1) of ALS Environmental's QAM (Appendix B). The sampling personnel will retain a copy of the COC. The COC will include at least the following information:

- Name of person collecting the samples
- Date and time samples were collected
- Sample ID
- Canister and flow controller ID
- Canister pressure (start and stop)
- Analyses requested
- Signature of the sampling person relinquishing samples to a non-sampling person (such as a Federal Express agent or laboratory courier), with the date and time of transfer

In addition, if samples are known to require expedited turnaround in the laboratory due to project time constraints or analytical concerns such as extraction time or sample retention

period limitations, the person completing the COC record will note these constraints in the remarks section of the custody record and will notify the Laboratory Project Manager of the expedited turnaround requirement.

3.2.5 Laboratory Custody Procedures

Information regarding the laboratory's sample receipt, handling and custody procedures are presented in ALS Environmental's QAM (Section 6.0). Below is a brief overview of lab custody procedures.

Upon arriving at the laboratory, samples are logged in by a designated sample custodian giving each sample a unique laboratory designation/ID. Sample receipt protocols and storage conditions include the following:

- Verify samples received are listed in the COC. Notify Laboratory Project Manager if not listed.
- Verify that sample holding times have not been exceeded. Notify Laboratory Project Manager if hold times have been exceeded.
- Examine shipping records for accuracy and completeness.
- Sign COC and attach the waybill.
- Note any other problems with the samples on the receipt form, specifically with preservation and contact the Laboratory Project Manager if problems are identified.
- Log samples into the Master Logbook and into the Laboratory Information Management System, and attach the laboratory sample numbers to each sample container.
- Measure the vacuum of the received canisters using a calibrated gauge.
- Place the samples into proper laboratory storage.

The Laboratory Project Manager will send a copy of the laboratory sample receipt form via email to the AMEC Project Manager, or an acceptable representative, and AMEC will verify that the samples were received in an acceptable condition. The laboratory will also generate an intra-lab COC that will be maintained while the samples are being analyzed and remain in lab custody. This procedure ensures that the sample integrity is maintained through adequate protection from contamination from outside sources or from highly contaminated samples.

Holding times are the responsibility of the laboratory for samples received within 48 hours of sampling or if less than half of the holding time has passed. If a holding time is exceeded, the laboratory will identify and document the root cause of the failure, and will contact the Laboratory Project Manager.

3.3 ANALYTICAL METHOD

Site-related VOCs in air samples and associated QC samples will be analyzed by USEPA Method TO-15 SIM. The laboratory's standard operating procedure for Method TO-15 is included as Appendix F. The air samples are collected in specially-prepared stainless steel canisters. A known volume of sample is directed from a canister through a solid multi-sorbent concentrator where VOCs are trapped. VOCs are then released by thermal desorption and carried onto a gas chromatographic column for separation and identification using a mass spectrometer. The mass spectrometer is operated using the selective ion monitoring (SIM) mode, which allows for detection of specific analytes with increased sensitivity relative to full scan mode. Responses of detected analytes are compared to responses of standards with known concentrations to establish the analyte concentration present in the sample.

3.4 FIELD QUALITY CONTROL

The field quality control program ensures that samples collected are representative of the media being sampled and that the data generated are valid. Field quality control will be accomplished through accurate record keeping in the field logbook and FDRs and collection and analysis of QC samples including field duplicates and trip blanks. Field quality control criteria are summarized in Table 2.

QC blank data will be reviewed during data validation to assess possible impacts of field or lab contamination on sample results. Problems that require corrective action may be encountered in the field. Findings that require corrective action will be communicated to the Project Manager and documented in the field logbook. The Project Manager will confirm that corrective actions have been implemented and that the problem has been resolved. If more easily addressed problems are encountered in the field, such problems will be addressed and the corrective action noted in the field logbook. If an error is made

on an accountable document assigned to one individual, that individual will make corrections by crossing a line through the error, entering the correct information, and initialing and dating the correction. The erroneous information will not be obliterated. The person who made the entry will correct any subsequent error discovered on an accountable document.

The following sections describe quality control samples that will be collected during implementation of the VI Work Plan.

3.4.1 Field Duplicates

Field duplicates are two samples taken from the same location at the same sampling time, but submitted to the laboratory as a separate sample and analyzed separately. Duplicate samples will be collected using two SUMMA® canisters connected with a stainless steel "tee" fitting to produce one air inlet. Field duplicates will be collected at a frequency of ten percent. At least one duplicate sample will be collected from a crawlspace air sample location, one duplicate will be collected from an indoor air location and one duplicate sample will be collected from an ambient (outdoor) air sample location. The acceptance criteria for field duplicate samples is an RPD of less than or equal to 50 percent.

3.4.2 Trip Blanks

A trip blank is utilized to detect possible VOC contamination of samples to be analyzed for VOCs. A trip blank canister will be individually cleaned and certified by the laboratory and will accompany the sample containers during transit, during sampling activities, and during storage with the collected samples prior to analysis. One trip blank sample will be analyzed per sampling event. The analytical results of trip blank samples will be evaluated during the data validation process to determine the representativeness of the field sample results and to determine if data qualification actions are necessary.

3.5 LABORATORY QUALITY CONTROL

Laboratory performance will be monitored by the inclusion of various internal QC checks that allow an evaluation of method control (batch QC) and the effect of the sample matrix on the data being generated (matrix-specific QC). The overall data quality objectives are to implement procedures for the laboratory analysis and reporting of the data that are

indicative of the degree of quality consistent with their intended use. Laboratory batch QC samples consist of method and instrument blanks, laboratory control samples, and calibration verification samples. Matrix specific QC samples consist of field and laboratory duplicates. ALS Environmental's general QC procedures are included in Section 9.0 of their QAM (Appendix B). ALS Environmental's QC procedures for Method TO-15 are included ALS Environmental's standard operating procedure for Method TO-15 (Appendix F).

3.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Maintenance and inspection of field and laboratory equipment are described in the following sections.

3.6.1 Field Equipment

Preventative maintenance of field measurement instrumentation and equipment will be performed according to the procedures presented in the manufacturer's instructions. The field staff and/or subcontractors are responsible for ensuring instrumentation is operating properly prior to use. If problems are encountered, they will be communicated to the FOL and documented in the field logbook. The faulty instrumentation/equipment will be scheduled for repair and then sequestered and tagged until repaired and qualified for re-use.

3.6.2 Laboratory Equipment

Testing, inspection, and maintenance of laboratory instruments/equipment will be conducted in accordance with the procedures specified in Section 12 of ALS Environmental's QAM (Appendix B) and Section 10.0 of ALS's standard operating procedure for Method TO-15 (Appendix F).

3.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

General guidance regarding calibration and frequency of calibration of field and laboratory equipment are described in the following sections.

3.7.1 Field Equipment

A thermometer will be used to measure outdoor and indoor air at the beginning and end of sample collection at each sample location. A PID will be used to measure the

concentration of potential VOCs in the vicinity of the sampling locations. Proper maintenance, calibration, and operation of the equipment will be the responsibility of the sampling personnel. The equipment used during the field investigations will be maintained, calibrated, and operated according to the manufacturer's guidelines and recommendations. Calibration of the equipment will be documented in the field logbook.

The PID will be calibrated using two-point calibration. One point will be zero air calibration gas and the second point will be a standard reference gas of known concentration. The PID's computer has a set of known/pre-programmed gases and concentrations, so isobutylene at 100 ppm will be selected for the second calibration point. The calibration will be verified after the two-point procedure. The calibration will be acceptable when the fresh air concentration is within 5 ppm for the zero air calibration, and the gas concentration is within 10 percent of the standard gas concentration.

3.7.2 Laboratory Equipment

The calibration of laboratory instruments and support equipment is necessary to ensure that the analytical system is operating correctly and functioning within the guidelines of precision, accuracy, and sensitivity. The frequency and type of calibration for laboratory equipment/procedures and control limits/acceptance criteria are presented in Section 9.0 of ALS Environmental's QAM (Appendix B) and Sections 11.0 and 12.0 of ALS Environmental's standard operating procedure for Method TO-15 (Appendix F).

Reference standards are used to calibrate the equipment. Physical reference standards include weights for scales and balances, and certified thermometers for calibrating working thermometers. Chemical reference standards include reference materials traceable to recognized standards suppliers, and are generally associated with normal instrument calibrations. The standards must be verified by quantitation against a second known standard before the data is reported, and must meet specified QC criteria for calibration verification.

At minimum, the laboratory equipment must be calibrated and maintained at intervals prescribed by the method. An instrument is said to be calibrated when an instrument response can be directly related to the concentration of an analyte graphically through the use of a calibration curve. The low standard of the curve will be established by the

laboratory as the PQL. Results above the highest standard will be diluted into the calibration range and reanalyzed.

3.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Supplies and consumables that are anticipated to be used during the Vapor Intrusion Assessment include SUMMA® canisters, flow controllers, vacuum gauges, calibration gas, and personal protective equipment (gloves). The FOL is responsible for confirming that the materials meet the required specifications, are intact and in good condition, are available in adequate supply, and are stored appropriately until use. Certification of the SUMMA® canisters, flow controllers, and vacuum gauges will be provided by the laboratory and maintained in the project file. The laboratory's standard operating procedures related to the SUMMA® canisters are included in Appendices D and E.

The PID will be rented from an environmental equipment supplier. Calibration gases will be purchased from an environmental equipment supplier and maintained at the AMEC Asheville, North Carolina office until use. Calibration gas certifications will be reviewed to ensure that they are at the concentration ranges specified for the project and that they are within their expiration dates. Certification records will be maintained in the project files. Calibration acceptance criteria are indicated on the calibration record in Appendix C.

3.9 NON-DIRECT MEASUREMENTS

For the purposes of the Vapor Intrusion Assessment, non-direct measurements will include information/data from previous investigation reports, information regarding the environment of the sample location (i.e., information from the Occupied Dwelling Questionnaire), and meteorological data. Non-directly measured data will be retained in the project files. The data may be of unknown quality and will be assessed by the Project Manager and Quality Assurance Manager if the non-direct data is used in the decision making process.

3.10 DATA MANAGEMENT

The objective of data management is to establish procedures to be used during field investigations for documenting, tracking, and presenting investigative data. Data

generated during the field investigations, as well as previously existing data, form the basis for developing conclusions and recommendations. Efficient utilization and comprehensive consideration of available data requires that the data be properly organized for review. Organization of the data will be planned prior to collection to assure the generation of identifiable and useable data. This section describes procedures necessary to provide for collecting sufficient data to accurately validate raw data and to transfer validated data to a data management system through which it can be evaluated with minimal effort. This section also describes the operating practices to be followed by personnel while collecting and reporting data.

3.10.1 Investigation Data

The following data will be collected and maintained in the project file:

- Air sampling records (FDR and logbooks including observations, temperature, and PID readings)
- Meteorological data obtained from the State Climate Office of North Carolina
- Photographs
- COC records

The flow of data for the project will be as follows:

- Field data records, including COCs, will be forwarded to the FOL, if collected by others.
- Air samples will be sent to the selected laboratory.
- Laboratory results, including EDDs and hard copies, will be sent to the FOL; the FOL will forward the laboratory results, including EDDs to the Quality Assurance Manager.
- The Data Reviewer will perform data validation with oversight by the Quality Assurance Manager. The validated data will be transferred in electronic format to the FOL.

3.10.2 Off-Site Laboratory Data

The laboratory will provide a hardcopy analytical report to document the chemical testing and report analytical results. Data deliverables will include sample result and QC summary forms and all supporting raw data needed to verify sample results. For USEPA Method TO-15, forms similar to those defined under the USEPA Contract Laboratory Program (CLP) deliverables will be required. The laboratory can use customized reporting forms providing they contain equivalent information as CLP forms.

At a minimum, the data packages from the laboratory will include the following:

- Data package narrative
  - summary of analytical methods used
  - correlation of field sample identifications and laboratory sample identifications
  - data qualifier definitions
  - deviations from established QA/QC procedures with corrective action

- Sample results
  - project name
  - field sample identification
  - laboratory sample ID
  - unit of measurement
  - batch number
  - collection/extraction/analysis dates
  - detection limits
  - dilution factors

- Sample documentation
  - original chain-of-custody
  - shipping documents
  - receipt forms

- Quality Assurance/Quality Control
  - spike recoveries (LCS)
  - internal standard summary
  - initial calibration summaries
  - GC/MS tuning summaries
  - continuing calibration summaries
  - QC blank summaries
  - measures of precision (laboratory duplicates)
  - control limits for accuracy and precision
  - surrogate recoveries

- Raw data including instrument printouts (run sequence/acquisition files, chromatograms and quantitation reports), instrument logbook pages, and sample preparation logs.

Sample results will be provided by the laboratory in both electronic and hard copy format. Hard copy and EDDs from the laboratory will be transmitted to the Quality Assurance Manager and Project Chemist. The electronic data will be provided in a format described in Table 3. Electronic lab results will be imported into the AMEC TED. Files of the unvalidated electronic data are provided to the Project Chemist for used during data

validation. The project chemist will make any necessary data qualification and changes based on the data validation review, and qualified results are entered back into the TED database. During data validation a quality assurance review of sample results will be completed to ensure that the data in the database match the hard copy provided by the laboratory.

Final validated laboratory data will be maintained in the TED database to allow easy retrieval of information and electronic transfer of the data to other parties. Once final data are entered into the TED and validation is completed, data reports will be generated as needed to support contamination assessments and report preparation. A data validation report will be prepared and will be organized by sample collection task and might include multiple sample delivery groups (SDGs). The validation report(s) will include the following information:

- Introduction
    - description of sampling task
    - identity of the laboratory used for analysis
    - a summary of analytical methods
    - a table summarizing summary of SDGs and samples are included in the report
    - a description of the data validation process
    - a table summarizing project QC limits
- Validation actions and observations
    - a discussion of data validation actions, qualifications, and observations
    - a table summarizing all data qualification actions
    - A tabulation of validated samples results
- References cited

Upon completion of the field investigation and subsequent validation of off-Site laboratory data, an EDD will be prepared with relevant field information and laboratory data in the format specified for environmental data in the Region 4 Science and Ecosystem Support Division (SESD) database (Data Archival and ReTrieval – DART or Equis Pro interface). This database is the USEPA Region 4 repository for storing Superfund data, which includes location, geological, and analytical data. Data will be submitted in accordance with the SESD's Environmental Data Submission Guideline SESDGUID-106-RO (USEPA, 2010).

4.0 ASSESSMENT AND OVERSIGHT

Internal and external checks (assessments) have been built into this project to assure the following:

- Elements of this QAPP have been properly implemented as prescribed
- The quality of the data generated is adequate and satisfies the DQOs that have been identified in this QAPP
- Corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed

Formal audits are not planned for this program. The FOL will provide training and oversight to field crews and review field records on a daily basis to verify that sample collection procedures and record keeping steps are being completed in accordance with the FSAP and QAPP. The USEPA may complete reviews and audits of the field sampling events at any time during the monitoring program.

If deviations from the Work Plan, this QAPP, or the FSAP are identified, the information will be verbally reported to the Project Manager and noted in the field logbook. Based on the severity of the deviation, the Project Manager might request formal documentation of the deviation in the form of a memorandum to the project file. The Project Manager will determine the timeframe required for corrective action, if corrective action is necessary. Corrective actions will be completed and an assessment of the potential impact on data quality will be made. Project reviews and summaries of issues requiring corrective actions will be summarized in the Site logbook. If potential impact to data quality is identified, a summary of the issues, corrective actions, and impacts to data will be provided to the Quality Assurance Manager for use during the validation of the analytical data. Impacts to data use will be identified in data quality reports prepared for each sampling round.

5.0 DATA VALIDATION AND USABILITY

Data validation involves reviewing and accepting, qualifying, or rejecting data based on requirements in the referenced analytical methods, data validation guidelines, and QC goals established for this project in Section 2.4. Data validation will be conducted based on procedures in the USEPA Region 4 Data Validation Standard Operating Procedures for Organic Analysis (USEPA, 2008), in conjunction with Method TO-15 SIM and the ALS Environmental TO-15 standard operating procedure (Appendix F). Project QC limits identified in Table 2 will be used as to evaluate sample results during validation. Validation will be performed by the Project Chemist, under the direction of the Quality Assurance Manager.

Data validation will consist of a systematic review of the analytical results and associated QC methods and results. In any area not specifically addressed by USEPA guidelines, best professional judgment will be utilized and described in the Usability Assessment portion of the data validation report.

In general, data validation will include a check of data completeness for data in each data package, a transcription check for sample results, and a review of laboratory reporting forms. Specifically, this review will include the following:

- Data package completeness
- Required reporting summary forms to determine whether the QC requirements were met and to determine the effect of QC requirements on the precision, accuracy, and/or sensitivity of the data
- Additional QA/QC parameters, such as field duplicates, to assess the technical usability of the data
- Application of standard data quality qualifiers to the data

In addition, each data validation effort will include a comprehensive review of the following data quality indicators:

- Sample collection, preservation, and holding times (to assess potential for degradation that could affect accuracy)
- Blanks (to assess cross-contamination)
- Surrogate/system monitoring compounds (to assess method accuracy)
- Laboratory Control Samples (to assess accuracy of the method)

- Instrument tuning and calibration
- Compound quantitation limits and method detection limits (to assess sensitivity compared to project-specific requirements)
- Field duplicate relative percent differences (to assess precision of the method relative to field sampling techniques, the specific sample matrix, and representativeness of the sample aliquot to the area sampled, if applicable)

Analytical results may be qualified by the data validator based on actions described in the USEPA validation guidelines or professional judgment. Results may be accepted without qualification or with validation qualifiers (e.g., U, J, UJ, N). Results that don't meet minimum criteria for acceptance (i.e., qualified as rejected during validation) will be unacceptable for decision making purposes. At a minimum, data rejection criteria identified in the USEPA validation documents will be applied to results.

The following validation qualifiers may be applied to sample results:

- U = target analyte is not detected above the associated detection limit
- J = the reported sample concentration is an estimate value
- UJ = the reported quantitation limit is an estimated value
- N = there is uncertainty in the identification of the reported analyte
- R = constituent rejected and unusable for detect and non-detects

The results of the data validation and any corrective actions implemented will be recorded on a QA/QC worksheet, which will be initialed and dated by the data reviewer. The Quality Assurance Manager or appropriate designee will provide secondary review of the QA/QC worksheet and will also initial and date the worksheet. The initialed and dated QA/QC worksheet will be attached to the final analytical laboratory report that is retained in the project files.

Full validation, including raw data verification and calculation checks, will be completed on the laboratory data. Results will be qualified using general procedures described in the USEPA validation guideline and the judgment of the project chemist. Upon completion of the validation task, a report will be prepared. Validation reports will be organized by sample collection task and may include be designed to report on multiple sample delivery groups.

The validation report(s) will include the following information:

- Identity of the laboratory used for analysis
- A summary of analytical methods
- A summary of samples that are included in the sample set
- A discussion of data validation actions, qualifications, and observations
- A tabulation of validated samples results

Qualifiers applied to the data during validation will be entered into the electronic data deliverables in the database.

6.0 RECONCILIATION OF DATA TO PROJECT OBJECTIVES

At the end of the project there will be an assessment of field records, field data, laboratory analytical data usability, and project completeness to determine if project objectives defined in the FSAP and QAPP have been met. The FOL and Project Manger will review field records and reports to verify completeness of field records and identify any issues regarding project procedures, collection of field data that did not meet quality objectives, the completeness of the samples collected, or corrective actions. A review of the data validation report associated with the laboratory data will also be completed by the Quality Assurance Manager in cooperation with the FOL and Project Manger to identify data that is qualified. An assessment of impacts from field issues or data qualification actions will be performed and documented in a data usability report. Impacts might include identification of entire samples or a subset of analytes where data are considered unusable. In other cases, uncertainties in the accuracy of usable data might be identified.

In the Vapor Intrusion Assessment Report, a data quality and completeness summary will be provided that identifies data gaps or analytical data quality issues that are identified in field operation reports or analytical data validation reports. The following items will be included in the data usability summary:

- Field investigation scope modifications
- Field investigation data quality issues
- Field investigation data gaps (data that was planned for collection and not obtained)
- Field and analytical data completeness
- Analytical data validation qualification actions and impacts on data usability
- Analytical detection limits and impacts on data usability

The need for recollection of sample or other actions related to the data usability will be determined on a case by case basis with input from the USEPA Project Manager.

7.0 REFERENCES

USEPA, 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4), EPA/240/B-06/001, February 2006.

USEPA, 2008. Data Validation Standard Operating Procedures for Organic Analyses; USEPA Region 4, Science and Ecosystem Support Division Quality Assurance Section, MTSB; Athens, Georgia; August 2008.

USEPA, 2010. Communicating Environmental Data to Property Owners and Tenants (Standard Operating Procedure, Version #1), Interim Final, October 2010.

USEPA, 2010. Environmental Data Submission Guideline, Science and Ecosystem Support Division, Athens, GA; SESDGUID-106-RO, December 17, 2010.

TABLES

TABLE 1
Target Compounds and Reporting Limits
CTS of Asheville, Inc. Superfund Site
Asheville, North Carolina
AMEC Project 6252-12-0006

Analyte	CAS Number	PQL	MDL	GSL (a)	Basis of GSL Concentration	RSL (a)	Basis of RSL Concentration
cis-1,2-Dichloroethene	156-59-2	0.025	0.0055	3.5	nc	NL	NA
trans-1,2-Dichloroethene	156-60-5	0.025	0.0047	7	nc	6.3	nc
Trichloroethene	79-01-6	0.025	0.0067	0.022	c	0.43	c
Vinyl Chloride	75-01-4	0.025	0.0050	0.28	c	0.16	c

Prepared By: SEK 12/9/13
Checked By: MEW 12/9/13

Notes:
CAS - Chemical Abstracts Service
PQL - Practical Quantitative Limit
MDL - Method Detection Limit
RSL - Regional Screening Level (USEPA, November 2013)
GSL - Generic Screening Level (USEPA Office of Solid Waste and Emergency Response, Table 2c, November 2002)
nc - noncarcinogenic risk
c- carcinogenic risk
NL - analyte does not have a corresponding RSL.
Concentrations are in micrograms per cubic meter ($\mu g/m^3$)
(a) GSLs and RSLs based on noncarcinogenic (nc) hazard have been divided by ten to address additivity

TABLE 2
Project Quality Control Limits
CTS of Asheville, Inc. Superfund Site
Asheville, North Carolina
AMEC Project 6252-12-0006

Analyte	Primary Ion	Secondary Ion	Surrogate %Recovery	LCS %Recovery	Field Duplicate RPD	Lab Duplicate RPD
cis-1,2-Dichloroethene	96	98	70 - 130	62 - 130	50	25
trans-1,2-Dichloroethene	96	98	70 - 130	60 - 128	50	25
Trichloroethene	130	132	70 - 130	51 - 127	50	25
Vinyl Chloride	62	64	70 - 130	56 - 127	50	25

Notes:
LCS - laboratory control sample
RPD - relative percent difference

Prepared By: SEK 8/31/12
Checked By: CSR 8/31/12

TABLE 3
Laboratory Electronic Data Deliverable Format
CTS of Asheville, Inc. Superfund Site
Asheville, North Carolina
AMEC Project 6252-12-0006

Equis "EZEDD01" Field Name	data type	Required for "EDD"	Description	"TED" Table	"TED" Column
project_code	1 Text20	X	This field contains the internal project_code used by TED to identify a unique site. This will be provided to the lab on a per project basis.	Location	Site_id
sample_name	2 Text30	X	This field contains the sample number as written in the Analysis Request and Chain of Custody (AR/COC) form sent to the laboratory with the field samples for analysis. This is a unique number assigned to each sample by sampling personnel. For laboratory samples enter "LAB QC".	sample_collection	field_sample_id
sys_sample_code	3 Text20				
sample_date	4 Date	X	mm/dd/yyyy. Date sample was collected in the field. Date information must be identical with the date from the AR/COC form. Leave blank for lab samples. Year may be entered as yyyy.	sample_collection	field_sample_date
sam. le_time	5 Time				
analysis_location	6 Text2				
lab_name_code	7 Text10	X	Laboratory that performed the analysis.	sample_analysis	lab_id
lab_sample_id	8 Text20	X	Unique sample ID internally assigned by the laboratory.	sample_analysis	lab_sample_id
sample_type_code	9 Text10	X	Specifies sample type. For field samples, enter FS (regular environmental sample), otherwise, use values listed in the LOV. For example, normal field samples must be distinguished from laboratory method blank samples, etc.	sample_collection	qc_code
Lab_Del_Group	10 Text20	X	Tracking code used by the laboratory. Commonly called Sample Delivery Group (SDG).	sample_analysis	lab_sample_delivery_group
Lab_Batch_Number	11 Text20		Tracking number used by the laboratory to identify a group of samples analyzed in the same batch. This field, in conjunction with laboratory blank ID, is used to link the relationship between field samples and laboratory blank and other QC samples.		
lab_anl_method_name	12 Text35	X	Test method used in the analysis of the analyte.	sample_analysis	analysis_method

TABLE 3
Laboratory Electronic Data Deliverable Format
CTS of Asheville, Inc. Superfund Site
Asheville, North Carolina
AMEC Project 6252-12-0006

Equis "EZEDD01" Field Name	data type	Required for "EDD"	Description	"TED" Table	"TED" Column
cas_rn	13 Text15	X	Unique analyte identifier. Use assigned CAS number when one is identified for an analyte. Tentatively Identified Compounds (TICs) and a number of other analytes are not assigned a standard CAS number. The laboratory is required to assign a UNIQUE identifier for all chemical_names.	sample_analysis_results	casno
chemical_name	14 Text60	X	Name of analyte or parameter analyzed.		
result_value	15 Text20	X	Must only be a numeric value. It is stored as a string of characters so that significant digits can be retained. Must be identical with values presented in the hard copy. Analytical result is reported left justified. Reported as the reporting_detection_limit for non-detects.	sample_analysis_results	lab_result
lab_qualifiers	16 Text7	X	Qualifier flags assigned by the laboratory.	sample_analysis_results	lab_qualifier
result_unit	17 Text15	X	This format assumes that the result value and detect limit have the same units.	sample_analysis_results	result_uom
result_type_code	18 Text10	X	Parameter list type. Valid Values = Targer analytes (TCL, TAL or TRG); Surrogates (SUR); and TICs	sample_analysis_results	result_type
detect_flag	19 Text2	X	Enter “Y” for detected analytes or “N” for non-detected analytes.	sample_analysis_results	report_hit_flag
reporting_detection_limit	20 Text20	X	Must only be a numeric value. Use the value of the Reported Detection Limit (RDL), Practical Quantitation Limit (PQL), or Contract Required Quantitation Limit. Value is stored as a string to retain significant figures. Unit of measure must be identical with result_unit value.	sample_analysis_results	detection_limit
dilution_factor	21 Text6	X	Must be a numeric entry. The factor by which the sample was diluted as part of the preparation process. If no dilution was done, enter the value 1. Value is stored as a string to retain significant figures.	sample_analysis	dilution_factor
sample_matrix_code	22 Text10	X	Code which distinguishes between different type of sample matrix. For example, soil samples must be distinguished from ground water samples, etc. Valid codes for HESE are "G" (gas), "L" (liquid), "S" (solid), and "P" (free or raw liquid product).	sample_collection	matrix

TABLE 3
Laboratory Electronic Data Deliverable Format
CTS of Asheville, Inc. Superfund Site
Asheville, North Carolina
AMEC Project 6252-12-0006

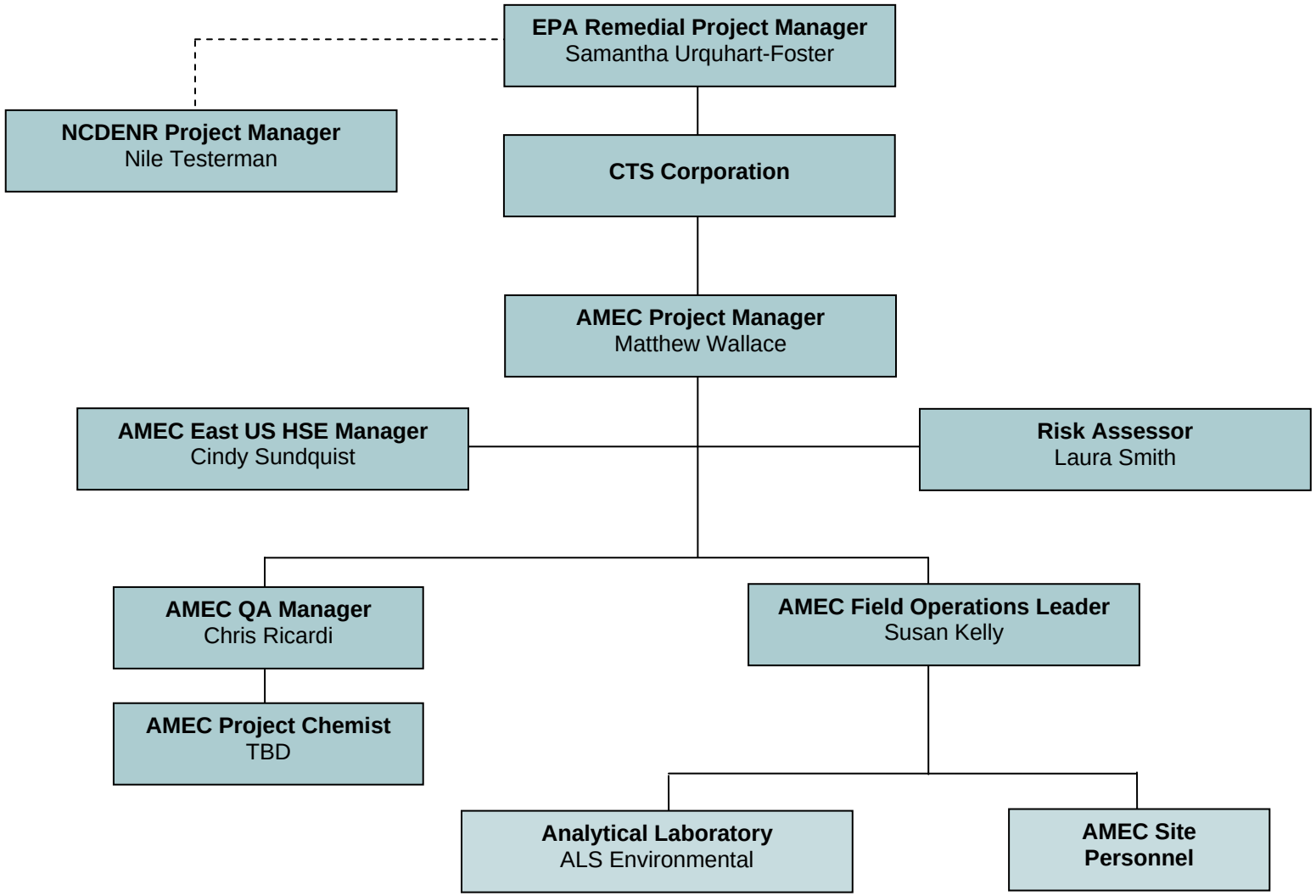
Equis "EZEDD01" Field Name	data type	Required for "EDD"	Description	"TED" Table	"TED" Column
total_or_dissolved (or fraction)	23 Text1	X	Must be “T” for total metal concentration, “D” for dissolved or filtered metal concentration, or “N” for organic (or other) parameters for which neither “total” nor “dissolved” is applicable. Also, HESE requires "C" for TCLP and "S" for SPLP fractions.	sample_analysis	fraction
basis	24 Text10				
analysis_date	25 Date	X	mm/dd/yyyy. Date sample was analyzed.	sample_analysis	analysis_date
analysis_time	26 Time				
method_detection_limit	27 Text20				
lab_prep_method_name	28 Text35		Description of sample preparation or extraction method.	sample_analysis	prep_method_name
prep_date	29 Date	X	mm/dd/yyyy. This field is used to determine whether holding times for field samples have been exceeded.	sample_analysis	extraction_date
[illegible]	[illegible]				
test_batch_id	31 Text20	X	Default is 1 for primary results. Other valid values are 2, 3, 4, 5, and RE. Primary use is for reanalyses and dilutions where more than one result may be reported.	sample_analysis	run_id
result_error_delta	32 Text20				
TIC_retention_time	33 Text8				
qc_level	34 Text10		Laboratory QC level associated with the analysis	sample_analysis	qc_level
result_comment	35 Text255		Any comments related to the analysis.	sample_analysis_results	comments
sample_quantitation_limit (may be REQUIRED FIELD for certain projects)	36 Text20		Must only be a numeric value. Use the value of the Sample Quantitation Limit (SQL). Value is stored as a string to retain significant figures. Unit of measure must be identical with result_unit value.	sample_analysis_results	TBD

Note: All "X" marked fields are minimum data required to load data to "TED".

APPENDIX A

ORGANIZATION CHART

Organization Chart



APPENDIX B

ALS ENVIRONMENTAL
QUALITY ASSURANCE MANUAL

ALS Environmental

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QUALITY ASSURANCE MANUAL

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QUALITY ASSURANCE MANUAL

DocID:	ALSMV-QAM	Rev. Number:	27.0	Effective Date:	01/11/2014

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Archival Date:	_____	Doc Control ID#:	_____	Editor:	_____

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QA MANUAL CROSS REFERENCE TABLE

ALS QAM	ISO 17025:2005 Section	TNI Vol 1 2009 Module/Section
2	4.1	2/4.1
3	4.2	2/4.2
4	4.3	2/4.3
5	4.4	2/4.4
6	4.5	2/4.5
7	4.6	2/4.6
8	4.7	2/4.7
9	4.8	2/4.8
15	4.9	2/4.9
16	4.10	2/4.10
16	4.11	2/4.11
16	4.12	2/4.12
17	4.13	2/4.13
18	4.14	2/4.14
19	4.15	2/4.15
2, 12, 13, 14	5.1	2/5.1
20	5.2	2/5.2
10	5.3	2/5.3
12, 13, 14	5.4	2/5.4
10	5.5	2/5.5
13	5.6	2/5.6
11	5.7	2/5.7
11, 12, 13	5.8	2/5.8
14	5.9	2/5.9
21	5.10	2/5.10

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1) Introduction and Scope

The purpose of this Quality Assurance Manual is to outline the quality system for the Simi Valley location of ALS Environmental (ALS Group USA Corp. dba ALS Environmental). ALS Environmental is a professional analytical services laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sludge, sediment, tissue, industrial and hazardous waste, air, and other material. Refer to Appendix J for a list of analytical capabilities specific to the Simi Valley location and corresponding accreditation status.

Quality Control (QC) procedures are used to continually assess performance of the laboratory and quality systems. ALS Environmental maintains control of analytical results by adhering to written standard operating procedures (SOPs), using analytical control parameters with all analyses, and by observing sample custody requirements. All analytical results are calculated and reported in units consistent with project specifications to allow comparability of data. Appendix H includes a list of data qualifiers and acronyms.

This QAM is applicable to the facility listed on the title page and the off-site extraction facility located at 2360 Shasta Way, Unit G, Simi Valley California.

The information in this QAM has been organized according to requirements found in the National Environmental Laboratory Accreditation Program (NELAP) Quality Systems Standards (2003 and 2009), the EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, USEPA, 2001; and *General Requirements for the Competence of Testing and Calibration Laboratories*, ISO/IEC 17025:2005.

2) Organization

2.1 Laboratory Organizational Structure

The laboratory is a legally identifiable organization and a division of a publicly owned corporation, ALS Group USA Corp. dba ALS Environmental. ALS Group USA Corp. is a wholly owned subsidiary of ALS Limited. Organizational charts detailing the operational structure and reporting relationships in the laboratory are provided in Appendix B.

2.2 Avoiding Conflict of Interest through Organizational Structure

2.2.1 Through application of the policies and procedure outlined in this QA Manual and use of a defined organizational structure, the laboratory assures that it is impartial and that personnel are free from undue commercial, financial, or other undue pressures that might influence their technical judgment.

2.2.2 Policies are in place to prevent outside pressures or involvement in activities that may affect competence, impartiality, judgment, operational integrity, or the quality of the work performed at the laboratory.

2.2.3 Management and technical personnel have the authority and resources to carry out their duties and have procedures to identify and correct departures from the laboratory's management system.

2.2.4 Personnel understand the relevance and importance of their duties as related to the maintenance of the laboratory's management system. Ethics and data integrity procedure ensure that personnel do not engage in activities that diminish confidence in the laboratory's capabilities. Procedures and policies are also established to ensure confidentiality is maintained.

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3) Management

The purpose of the QA program at ALS Environmental is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality.

3.1 Quality Policy Statement

The policy at ALS is to use good professional practices, to maintain quality, to uphold the highest standard of service, and to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations. We recognize that quality assurance requires a commitment to quality by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory. Laboratory management is committed to ensuring the effectiveness of its quality systems and to ensure that all tests are carried out in accordance to customer requirements. Key elements of this commitment are set forth in the *SOP for Laboratory Ethics and Data Integrity* (CE-GEN001) and in this Quality Assurance Manual (QAM). ALS Environmental is committed to operate in accordance with these requirements and those of regulatory agencies, accrediting authorities, and certifying organizations. The laboratory also strives for improvement through varying continuous improvement initiatives and projects.

Quality Management Systems are established, implemented and maintained by management. Policies and procedures are established in order to meet requirements of accreditation bodies and applicable programs as well as client's quality objectives. The laboratory's management is committed to complying with the National Environmental Laboratory Accreditation Conference (NELAC) Quality Systems Standards (2003 and 2009), ISO/IEC 17025:2005, and the Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories. Systems are designed so that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. Quality Systems are applicable to all fields of testing in which the laboratory is involved. All personnel involved with environmental testing and calibration activities must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

3.2 Quality Management Systems

The laboratory has developed a Quality Management System to ensure all products and services meet our client's needs. The system is implemented and maintained by the Quality Assurance Manager (QA Manager) with corporate oversight by the Corporate Quality Assurance Manager (CQAM). These systems are based upon ISO 17025:2005 standards, upon which fundamental programs (AIHA, NELAC 2003, 2009 and DoD QSM) are based. Implementation and documentation against these standards are communicated in corporate policy statements, this QAM, and SOPs. Actual procedures, actions and documentation are defined in both administrative and technical SOPs. Figure 3-1 shows the relationships of the quality systems and associated documentation. Quality systems include:

- Standard Operating Procedures
- Sample Management and Chain of Custody procedures
- Statistical Control Charting
- Standards Traceability
- Ethics Training

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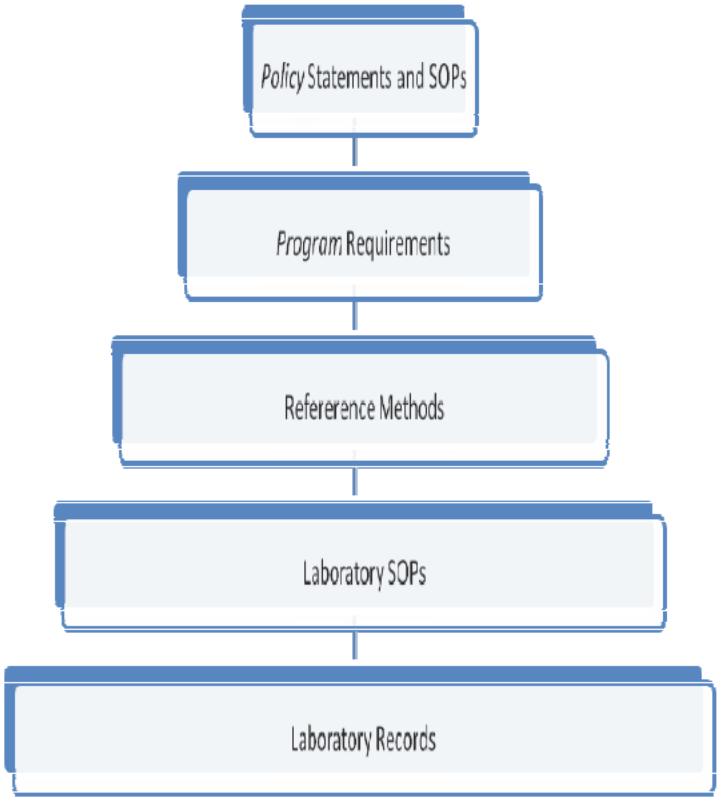
- Document Control
- Corrective Action Program
- Management Reviews
- Demonstration of Capability

The effectiveness of the quality system is assessed in several ways, including:

- Internal and External Audits covering all aspects of the organization
- Annual Management Reviews
- Analysis of Customer Feedback
- Internal and External Proficiency Testing

Figure 3-1

Relationships of Quality Management Systems and Documentation



3.3 Technical Elements of the Quality Assurance Program

The laboratory's technical procedures are based upon procedures published by various agencies or organizations (See Section 23). The Quality Assurance Program provides laboratory organization, procedures, and policies by which the laboratory operates. The necessary certifications and approvals administered by external agencies are maintained by the QA department. This includes method approvals and audit administration. In addition, internal audits are performed to assess compliance with policies and procedures. SOPs are maintained for technical and administrative functions. A document control system is used for SOPs, as well as laboratory notebooks, and this QA Manual. A list of QA Program documents is provided in Appendix I and SOPs in Appendix G.

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Acceptable calibration procedures are defined in the SOP for each test procedure. Calibration procedures for other laboratory equipment (balances, thermometers, etc.) are also defined. Quality Control (QC) procedures are used to monitor the testing performed. Each analytical procedure has associated QC requirements to be achieved in order to demonstrate data quality. The use of method detection limit studies, control charting, technical training and preventive maintenance procedures further ensure the quality of data produced. Proficiency Testing (PT) samples are used as an external means of monitoring the quality and proficiency of the laboratory. PT samples are obtained from qualified vendors and are performed on a regular basis. In addition to method proficiency, documentation of analyst training is performed to ensure proficiency and competency of laboratory analysts and technicians. Sample handling and custody procedures are defined in SOPs. Procedures are also in place to monitor the sample storage areas. The technical elements of the QA program are discussed in further detail in later sections of this QA manual.

3.4 Professional Conduct

One of the most important aspects of the success of ALS Environmental is the emphasis placed on the integrity of the data provided and the services rendered. This success is reliant on both the professional conduct of all employees within ALS Environmental as well as established laboratory practices.

To promote quality, ALS Environmental requires certain standards of conduct and ethical performance among employees. The following examples of documented ALS Environmental policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action.
- Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.
- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible.
- It is the responsibility of all ALS Environmental employees to safeguard sensitive company information, client data, records, and information; and matters of national security concern should they arise. The nature of our business and the well-being of our company and of our clients is dependent upon protecting and maintaining proprietary company/client information. All information, data, and reports (except that in the public domain) collected or assembled on behalf of a client is treated as confidential. Information may not be given to third parties without the consent of the client. Unauthorized release of confidential information about the company or its clients is taken seriously and is subject to formal disciplinary action. All employees sign a confidentiality agreement upon hire to protect the company and client's confidentiality and proprietary rights.

3.5 Prevention and Detection of Improper, Unethical or Illegal Actions

It is the intention of ALS Environmental to proactively prevent and/or detect any improper, unethical or illegal action conducted within the laboratory.

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This is performed by the implementation of a program designed for not only the detection but also prevention. Prevention consists of educating all laboratory personnel of their roles and duties as employees, company policies, inappropriate practices, and their corresponding implications as described here.

In addition to education, appropriate and inappropriate practices are included in SOPs such as manual integration, data review and specific method procedures. Electronic and hardcopy data audits are performed regularly, including periodic audits of chromatographic electronic data. Requirements are described in the *SOP for Internal Audits* (CE-QA001) and details are listed in laboratory administrative SOPs. All aspects of this program are documented and retained on file according to the company policy on record retention.

The *SOP for Laboratory Ethics and Data Integrity* (CE-GEN001) also contains information on the ALS Environmental ethics and data integrity program, including mechanisms for reporting and seeking advice on ethical decisions.

3.6 Laboratory Data Integrity and Ethics Training

New employees are given a QA and Ethics orientation within the first month of hire. On an ongoing basis, all employees receive annual ethics refresher training. Topics covered are documented in writing and all training is documented. It is the responsibility of the QA Manager to ensure that the training is conducted as described.

Key topics covered are the organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting, how and when to report data integrity issues and record keeping. Training includes discussion regarding all data integrity procedures, data integrity training documentation, in-depth data monitoring and data integrity procedure documentation.

Data integrity training provides assurance that a highly ethical approach to testing is a key component of all laboratory planning, method implementation, and training. There are four elements to the laboratory's procedures for data integrity. These include:

1) Data integrity training (conducted initially and at least annually);
2) Signed data integrity documentation for all employees;
3) In-depth periodic monitoring of data integrity;
4) Data integrity procedure documentation (*SOP for Laboratory Ethics and Data Integrity* (CE-GEN001)).

There is specific emphasis on the importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially deficient. A signature attestation sheet of data integrity training including their understanding of their obligations related to data integrity and as specified in the training is generated for attendees and maintained on file for review. Trainees are required to understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, or civil/criminal prosecution.

The training session includes many concepts and topics, numerous examples of improper actions (defined by DoD as deviations from contract-specified or method-specified analytical practices and may be intentional or unintentional), legal and liability implications (company and personal), causes, prevention, awareness, and reporting mechanisms.

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3.7 Management and Employee Commitment

ALS Environmental makes every attempt to ensure that employees are free from any commercial, financial, or other undue pressures that might affect their quality of work. Related policies are described in the *SOP for Laboratory Ethics and Data Integrity* (CE-GEN001). This includes:

- ALS Environmental Open Door Policy – Employees are encouraged to bring any work related problems or concerns to the attention of local management or their Human Resources representative. However, depending on the extent or sensitivity of the concern, employees are encouraged to directly contact any member of upper management.
- FAIRCALL – An anonymous and confidential reporting system available to all employees that is used to communicate misconduct and other concerns. The program shall help minimize negative morale, promote a positive work place, and encourage reporting suspected misconduct without retribution. Associated upper management is notified and the investigations are documented.
- Use of flexible work hours. Within reason and as approved by supervisors, employees are allowed flexible work hours in order to help ease schedule pressures which could impact decision-making and work quality.
- Operational and project scheduling assessments are continually made to ensure that project planning is performed and that adequate resources are available during anticipated periods of increased workloads. Procedures for subcontracting work are established, and within the ALS Environmental laboratory network additional capacity is typically available for subcontracting, if necessary.
- Gifts and Favors (Code of Conduct Agreement) – To avoid possible conflict of interest implications, employees do not receive unusual gifts or favors to, nor accept such gifts or favors from, persons outside the Company who are, or may be, in any way concerned with the projects on which the Company is professionally engaged.

All employees are required to sign and adhere to the requirements set forth in the *Code of Conduct Agreement, Confidentiality Agreement,* and *Ethics and Data Integrity Agreement*. The *Ethics and Data Integrity Agreement* is signed by all employees on an annual basis (see Appendix C).

3.8 The ALS Environmental-Simi Valley staff, consisting of approximately 37 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds, experience, and provide the comprehensive skills that the laboratory requires. As seasonal workload increases, temporary employees may be hired to perform specific tasks.

ALS Environmental is committed to providing an environment that encourages excellence. All employees share the responsibility for maintaining and improving the quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. Table 3-1 lists the ALS Environmental-Simi Valley personnel assigned to these key positions. Managerial staff members are provided the authority and resources needed to perform their duties. An organizational chart of the laboratory, as well as the resumes of key personnel, can be found in Appendix B.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. The Laboratory Director provides leadership and support for the QA program and is responsible for overall laboratory efficiency and the financial performance of the Simi Valley facility.

Non-Controlled

The Laboratory Director has the authority to stop work in response to quality problems. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves this QA Manual, reviews and approves standard operating procedures (SOPs), and provides support for business development by identifying and developing new markets through continuing support of the management of existing client activities.

- The **Quality Assurance Manager** (QA Manager) has the authority and responsibility for implementing, maintaining, and improving the quality system. This includes coordination of QA activities within the laboratory, ensuring that all personnel understand their contributions to the quality system, ensuring communication takes place at all levels within the laboratory regarding the effectiveness of the quality system, evaluating the effectiveness of training; and monitor trends and continually improve the quality system. Audit and surveillance results, control charts, proficiency testing results, data analysis, corrective and preventive actions, customer feedback, and management reviews can all be used to support quality system implementation. The QA Manager is responsible for ensuring compliance with NELAC standards (and ISO, DoD QSM, etc. as applicable). The QA Manager works with laboratory staff to establish effective quality control and assessment plans and has the authority to stop work in response to quality problems. The QA Manager is responsible for maintaining the QA Manual and performing an annual review of it; reviewing and approving SOPs and ensuring the annual review of technical SOPs; maintaining QA records such as metrological records, archived logbooks, PT results, etc.; document control; conducting PT sample studies; approving nonconformity and corrective action reports; maintaining the laboratory's certifications and approvals; and performing internal QA audits.

  The QA Manager reports directly to the Laboratory Director and also reports indirectly to the Corporate Quality Assurance Manager. It is important to note that when evaluating data, the QA Manager does so in an objective manner and free of outside, or managerial, influence.

- The Corporate Quality Assurance Manager (CQAM) is responsible for the overall QA program at all the ALS Environmental USA laboratories. The CQAM is responsible for oversight of QA Managers regulatory compliance efforts (NELAC, ISO, DoD, etc). The CQAM or designee performs annual internal audits at each laboratory; maintains a database of laboratory certification/accreditation programs; approves company-wide SOPs; provides assistance to the laboratory QA staff and laboratory managers; etc.

➢ In the case of absence of the Laboratory Director or QA Manager, deputies are assigned to act in that role. Default deputies for these positions are a Project Manager or Volatile Organics Technical Manager (for the Laboratory Director) and the CQAM or Laboratory Director (for the QA Manager).

➢ In the event that work is stopped in response to quality problems, only the Laboratory Director or QA Manager have the authority to resume work.

- The **Environmental Health and Safety Coordinator** (EH&S) is responsible for the administration of the laboratory health and safety policies.

Non-Controlled

This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The EH&S Coordinator is also designated as the Chemical Hygiene Officer. The EH&S Coordinator has a dotted-line reporting responsibility to ALS's Environmental EH&S Director.

- The **Data Validation Coordinator/Reporting Supervisor** is responsible for data review, data package preparation, review and coordination, and preparation of case narratives (based on the information provided by the laboratory).
- The **Client Services Manager** is responsible for the Client Services Department defined for the laboratory (i.e. Project Managers, data reporting, etc.) and the sample management office/bottle preparation sections. The Client Services Department provides a complete interface with clients from initial project specifications to final deliverables. Sample management handles all activities associated with receiving, storage, and disposal of samples. The Client Services Manager has the authority to stop subcontractor work in response to quality problems.
- The **Project Manager** is a scientist assigned to each client to act as a technical liaison between the client and the laboratory. The Project Manager is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the ALS Environmental laboratory and administrative staff to ensure that client-specific needs are understood and that the services ALS Environmental provides are properly executed and satisfy the requirements of the client.
- The Analytical Laboratory is divided into operational units based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a QC program meeting department needs. Each **Department Manager and Supervisor** has the responsibility to ensure that QC functions are carried out as planned, and to guarantee the production of high quality data. Department managers and bench-level supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each department manager has the authority to stop work in response to quality problems in their area. Analysts have the responsibility to carry out testing according to prescribed methods, SOPs, and quality control guidelines particular to the laboratory in which he/she is working.
- The **Sample Management Office** plays a key role in the laboratory QA program by performing and/or assisting in the proper preparation and shipment of sampling media. In addition, personnel are responsible for the verification of sample receipt information, performing sample acceptance and log-in and distribution of documentation per laboratory defined procedures and the initial storage of samples in the proper environment and location and performing proper sample disposal. Responsibilities also include monitoring and recording of critical thermal preservation equipment temperatures and calibration of associated thermometers against NIST traceable thermometers.

Non-Controlled

- **Information Technology** (IT) staff is responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, IT systems development and implementation, education of analytical staff in the use of scientific software, Electronic Data Deliverable (EDD) generation, and data back-up, archival and integrity operations.

Table 3-1
Summary of Technical Experience and Qualifications

Personnel	Years of Experience	Project Role
Kelly Horiuchi, B.A.	13	Laboratory Director / Project Manager
Chaney Humphrey, B.S.	9	Quality Assurance Manager
Robin Gill	33	Data Validation Coordinator / Reporting Supervisor
Ku-Jih Chen, B.S.	38	Principle Chemist
Sue Anderson, B.S.	23	General (WET) Chemistry Technical Manager / Project Manager
Samantha Henningsen, B.S.	4	Project Manager
Kathleen Aguilera, B.A.	24	Client Services Manager / Project Manager
Wade Henton, B.S.	27	Volatiles (GC) Technical Manager
Chris Parnell, B.S.	27	Operations Manager / Volatiles (GC/MS) Technical Manager
Wida Ang, B.S.,M.S.	28	Volatiles (GC/MS) Team Leader
Madeleine Dangazyan, B.S.	18	Semi-Volatiles / Industrial Hygiene Technical Manager
Manny Zamora	11	Sample Management Team Leader
Jeff Christian, B.S.	34	Director of Operations – Western U.S.

Non-Controlled

4) Document Control

4.1 Procedures for control and maintenance of documents are described in the *SOP for Document Control* (CE-GEN005). The requirements of the SOP apply to all laboratory logbooks (standards, maintenance, run logbooks, etc), certificates of analysis, SOPs, QAMs, quality assurance project plans (QAPPs), Environmental Health & Safety (EHS) manuals, and other controlled ALS Environmental documents.

4.2 The contents of this manual are reviewed, revised (as needed) and approved for use at least annually by authorized personnel (QA Manager, Laboratory Director, and Technical Directors) where the scope of the review ensures that it continuously reflects current policies and practices and incorporates all applicable requirements. Additionally, the date the review was completed is indicated by the date of the last approval signature on the title page.

4.3 Each controlled copy of a controlled document will be released only after a document control number is assigned and the recipient is recorded on a document distribution list. Filing and distribution is performed by the QA Manager, or designee, and ensures that only the most current version of the document is distributed and in use. A document control number is assigned to logbooks. Completed logbooks that are no longer in use are archived in a master logbook file. Logbook entries are standardized following the *SOP for Making Entries onto Analytical Records* (CE-QA007). The entries made into laboratory logbooks are reviewed and approved at a regular interval (quarterly).

4.4 A records system is used which ensures all laboratory records (including raw data, reports, and supporting records) are retained and available. The archiving system is described in the *SOP for Data and Record Archiving* (ADM-ARC).

4.5 External documents relative to the management system are managed by the QA Manager. To prevent the use of invalid and/or outdated external documents, the laboratory maintains a master list of current documents and their availability. The list is reviewed before making the documents available. External documents are not issued to personnel.

4.6 Electronic Signatures It is a policy of ALS Environmental to allow the use of electronic signatures. For data reporting an electronic signature may be applied to the report by an approved report signatory and is binding to the same extent as a handwritten wet signature.

To authenticate the electronic signature the identity of the signatory is verified before their electronic signature can be created. Each electronic signature shall be unique to a single individual and shall not be used by any other individual. These signatures are established using only defined procedures within the software and are verified using the two distinct components of *username* and *password*. Each use of the electronic signature requires entry of the username and the password. The report may not be changed once the signature has been applied.

Additionally, as a form of 'signature' used for LIMS, email, and certain internal documentation processes (e.g. acknowledgements, attestations, audit trails, etc.), and other electronic tools the user's system login credentials are used to verify and authenticate the identity of the user. Following login, these credentials are used to identify and document the user.

Non-Controlled

5) Review of Requests, Tenders and Contracts

5.1 Procedure for the Review of Work Requests

5.1.1 Requests for new work are reviewed prior to signing any contracts or otherwise agreeing to perform the work. The specific methods to be used are agreed upon between the laboratory and the client. A capability review is performed to determine if the laboratory has or needs to obtain certification to perform the work, to determine if the laboratory has the resources (personnel, equipment, materials, capacity, skills, expertise) to perform the work, and if the laboratory is able to meet the client's required reporting and QC limits. The results of this review are communicated to the client and any potential conflict, deficiency, lack of appropriate accreditation status, or concerns of the ability to complete the client's work are resolved.

5.1.2 Any differences between the request or tender and the contract shall be resolved before any work commences. The client should be notified at this time if work is expected to be subcontracted. Each contract shall be acceptable both to the laboratory and the client. Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work.

5.1.3 If a contract needs to be amended after work has commenced, the contract review process is repeated and any amendments are communicated to all affected personnel. Changes in accreditation status affecting ongoing projects must be reported to the client.

5.2 Allowed Deviations from Standard Operating Procedures

5.2.1 When a client requests a modification to an SOP the Project Manager must discuss the proposed deviation with the laboratory supervisor and obtain approval to accept the project. The Laboratory Director and QA Manager may also be involved. The Project Manager is responsible for documenting the approved or allowed deviation from the SOP.

5.2.2 When a client request necessitates a deviation or departure from company policies or procedure involving any non-technical function, the allowed deviation must be approved by the laboratory or the Laboratory Director. Frequent departure from policy is not encouraged. However, if frequent departure from any policy is noted, the Laboratory Director will address the possible need for a change in policy.

6) Subcontracting of Tests

Analytical services are subcontracted when the laboratory needs to balance workload or when the requested analyses are not performed by the laboratory. Subcontracting, to capable qualified laboratories is only done with the knowledge and approval of the client. Subcontracting to another ALS Environmental laboratory is preferred over external-laboratory subcontracting. Established procedures are used to qualify external subcontract laboratories. These procedures are described in the *SOP for Qualification of Subcontract Laboratories* (CE-QA004). The QA Manager is responsible for maintaining a list of qualified subcontract laboratories.

Non-Controlled

7) Purchasing Services and Supplies

The quality level of reagents and materials (grade, traceability, etc.) required is specified in the analytical SOPs. Department supervisors ensure that the proper materials are purchased. Inspection and verification of material ordered is performed at the time of receipt by receiving personnel. The receiving staff labels the material with the date received. Expiration dates are assigned as appropriate for the material. Storage conditions and expiration dates are specified in the analytical SOP. The *SOP for Handling Consumable Materials* (ADM-CONSUM) provides default expiration requirements. Supplies and services that are critical in maintaining the quality of laboratory testing are procured from pre-approved vendors. The policy and procedure for purchasing and procurement are described in the *SOP for Procurement and Control of Laboratory Services and Supplies* (CE-GEN007). Also, refer to section 13.5 for a discussion of reference materials.

Receipt procedures include technical review of the purchase order/request to verify that what was received is identical to the item ordered. The laboratory checks new lots of reagents for unacceptable levels of contamination prior to use in sample preservation, sample preparation, and sample analysis by following the *SOP for Quality of Standards and Reagents* (CE-QA012).

8) Service to the Client

The laboratory uses a number of systems to assess its daily operations. In addition to the routine quality control (QC) measurements, the senior laboratory management examines a number of other indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients including; on-time performance, customer complaints, training reports and non-conformity reports. A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload.

ALS Environmental utilizes a number of different methods to ensure that adequate resources are available for service demands. Senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating sufficient resources. All Requests for Proposal (RFP) documents are reviewed by Project Managers, Business Development and appropriate managerial staff to identify any project specific requirements that differ from the standard practices of the laboratory. Any requirements that cannot be met are noted and communicated to the client, as well as requesting the client to provide any project specific Quality Assurance Project Plans (QAPPs) if available. Status/production meetings are also conducted regularly with the laboratory and project managers to inform the staff of the status of incoming work, future projects, or project requirements.

When a customer requests a modification to an SOP, policy, or standard specification the Project Manager will discuss the proposed deviation with the Laboratory Director and department manager to obtain approval for the deviation. The QA Manager may also be involved. All project-specific requirements must be on-file and with the service request upon logging in the samples. The modification or deviation must be documented. A Project-Specific Communication Form, Form V, LIMS comments, or similar, may be used to document such deviations.

The laboratory shall afford clients cooperation to clarify the client's request and to monitor the laboratory's performance in relation to the work performed, provided that the laboratory ensures confidentiality to other clients. The laboratory maintains and documents timely communication with the client for the purposes of seeking feedback and clarifying customer requests. Feedback is used and analyzed to improve the quality of services. The *SOP for Handling Customer Feedback* (CE-GEN010) is in place for these events.

Non-Controlled

9) Complaints

The laboratory maintains a system for dealing with customer complaints. The person who initially receives the feedback (typically the Project Manager) is responsible for documenting the complaint. If the Project Manager is unable to satisfy the customer, the complaint is brought to the attention of the Client Services Manager, Laboratory Director, or QA Manager for final resolution. The complaint and resolution are documented. The procedure is described in the *SOP for Handling Customer Feedback* (CE-GEN010).

10) Facilities and Equipment

ALS Environmental-Simi Valley maintains approximately 20,000 square feet of laboratory and administrative workspace. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations. The ventilation system is designed to meet any needs of analyses performed in the separate work areas. ALS Environmental-Simi Valley minimizes laboratory contamination sources by employing janitorial staff to ensure good housekeeping. In addition, the segregated laboratory areas are designed for safe and efficient handling of a variety of sample types. These specialized areas (and access restrictions) include:

- Sample Management Office; Shipping and Receiving
- Records Archival
- Volatile Organics Laboratory (GC and GC/MS)
- Semi-Volatiles Laboratory (GC, GC/MS and HPLC)
- Ultra-Low Level Volatile Organics GC/MS
- General/Wet Chemistry Laboratory
- R&D Laboratory
- Canister Conditioning and Maintenance
- Flow Controller and Critical Orifice Calibration Station
- Sample Storage Walk-in Refrigerator
- Sample, Standards, and Media Storage
- Waste Disposal
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Information Technology (IT)

The designated areas for sample receiving, refrigerated sample storage, dedicated sample container preparation and shipping provide for the efficient and safe handling of a variety of sample types. Refer to Appendix D for facility floor plan. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. The equipment and instrumentation are appropriate for the procedures in use. Appendix E lists the major equipment, illustrating the laboratory's overall capabilities and depth.

ALS Environmental-Simi Valley also maintains a satellite extraction facility located at 2360 Shasta Way, Unit G, Simi Valley, California. The approximately 2,000 square foot building contains five fume hoods and is designed with the purpose of performing semi-volatile organics extraction of air, liquid and solid matrices. The extraction facility is equipped with sufficient bench space, glassware washing equipment and materials, flammable solvent storage, sample/extract storage refrigerators and an electric kiln. Refer to Appendix D for the floor plan of the facility.

Non-Controlled

10.1 Preventive Maintenance

Preventive maintenance is a crucial element of the Quality Assurance program. Instruments at ALS Environmental (e.g., GC/MS systems, gas and liquid chromatographs, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at ALS Environmental contain extensive information about the instruments used at the laboratory.

An initial demonstration of analytical control is required on every instrument used at ALS Environmental before it may be used for sample analysis. Each instrument must be recalibrated following any instrument maintenance which may change or effect the sensitivity or linearity of the instrument or if the continuing calibration verification acceptance criteria have not been met as specified in the standard operating procedure. If an instrument is modified or repaired, a return to analytical control is required before subsequent sample analyses can occur. When an instrument is acquired at the laboratory, the following information is noted in a bound maintenance notebook specifically associated with the new equipment:

- The equipment's serial number;
- Date the equipment was received;
- Date the equipment was placed into service;
- Condition of equipment when received (new, used, reconditioned, etc.); and
- Prior history of damage, malfunction, modification or repair (if known).

Preventive maintenance procedures, frequencies, etc. are available for each instrument used at ALS Environmental. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase.

Responsibility for ensuring that routine maintenance is performed lies with the department supervisor or laboratory director. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst who routinely operates the equipment. In the case of non-routine repair of capital equipment, the department supervisor is responsible for providing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. The laboratory maintains an adequate supply of expendable maintenance items (expected lifetime of part of less than 1 year.) These parts include items needed to perform the preventive maintenance procedures listed in Table 16-1.

When performing maintenance on an instrument (whether preventive or corrective), additional information about the problem, attempted repairs, etc. is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem;
- Repairs and/or maintenance performed;
- Description and/or part number of replaced parts;
- Source(s) of the replaced parts;
- Analyst's signature and date; and
- Demonstration of return to analytical control.

See the Table 16-1 for a list of preventive maintenance activities and frequency for each instrument.

Non-Controlled

For further information regarding Instrumentation see the *SOP for Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation* (ADM-INSTRUM).

10.2 Temperature Control

Temperatures are monitored and recorded for all critical measurement temperature-regulating devices including freezers, refrigerators and ovens. Each piece of equipment is labeled with a unique identifier, the required temperature or range of use according to the needs of the analysis or application. Temperature record books are kept which contain equipment identifier, daily-recorded temperatures (if in use, business days), acceptance criteria and the initials of the laboratory staff member who performed the checks for all temperature-regulating devices in daily use.

10.3 Water Purification Systems

Purified water is utilized for a number of laboratory functions including instrument and method blanks, trip blanks, washes and sample dilutions. The water purification system utilizes three mixed-ion beds, four filters, and resistively lights with constant water recirculation. It is designed to produce deionized water of ASTM Type II quality, with 16-18 megohm-cm resistance at 25˚C and is checked and recorded daily (prior to and if in use). Maintenance and repair on the system is conducted by an approved service supplier and all records including purification checks/verifications are maintained on file for review. For procedures on additional purification (i.e., boiling and/or purging) and purification checks/verifications, refer to the applicable method standard operating procedures.

11) Sample Management

Standard operating procedures have been established for all aspects of sample management within the laboratory including sample receiving, handling, acceptance, log-in, protection, storage, retention, transportation, and disposal. The procedures include provisions necessary to protect the integrity of the sample (as received) and to protect the interests of the laboratory as well as the client. These procedures ensure that samples are handled properly and that all associated documentation is complete and consistent. The sample handling factors that must be taken into account to ensure accurate, defensible analytical results include but are not limited to:

- Amount of sample taken (sampling)
- Type of container used
- Existence and type of sample preservation
- Holding Time
- Proper custodial documentation
- Sample storage, tracking and/or transfer
- Retention
- Disposal

A record of all procedures to which a sample is subjected while in the possession of the laboratory including acceptance, rejection, login, identification, preservation checks, storage, tracking, and disposal are documented and maintained. In addition, all indirect procedures which support each record of a sample and protects the integrity of a sample is documented and maintained (i.e., refrigerator and freezer temperature checks, thermometer calibrations, etc.).

11.1 Sampling

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples.

Non-Controlled

ALS Environmental-Simi Valley does not provide sampling services. The laboratory only provides materials needed for sample collection; therefore, ALS Environmental-Simi Valley recommends that clients follow sampling guidelines described in the specific reference methods including 40 CFR 136 and/or USEPA SW-846, NIOSH, OSHA, ASTM, CARB and SCAQMD as appropriate.

When transporting samples to the laboratory, the most expedient but lawful route of transport should be utilized. Also, the hazardous potential of the samples needs to be considered when shipping samples via air freight or passenger airlines.

11.2 Preservation

ALS Environmental-Simi Valley uses sample preservation, container, and holding time recommendations published in a number of referenced documents including, but not limited to USEPA SW 846, USEPA 600/4-79-020, USEPA 600/r-93-100 (inorganic substances), 600/4-91-010, and EPA/625/R-96/010b (air samples) and the US EPA Methods Update Rule effective 4/11/07. The complete citation for each of these and other references can be found in Section 23 of this document. The appropriate container, preservation and holding time information are summarized in Appendix F. Additional information on this is addressed in each corresponding method SOP.

11.3 Shipping of Containers and Samples

ALS Environmental-Simi Valley provides sample containers to clients via media requests for all matrices (soil, water, air) with the appropriate preservatives (as applicable). These containers include Tedlar bags, Summa canisters, silica-gel tubes, etc. ALS Environmental-Simi Valley keeps client-specific shipping requirements on file and utilizes all major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. ALS Environmental-Simi Valley also provides its own courier service that makes scheduled courier runs in the greater Los Angeles metropolitan area. The procedures for all requirements directed toward media requests follow the requirements detailed in the *SOP for Media Request Fulfillment* (MED-Media_Req).

11.4 Sample Receiving and Acceptance

It is the policy of ALS Environmental-Simi Valley to check and record the condition of each sample (i.e. pressure, temperature, etc.) delivered to the Sample Management Office (SMO) and received by the Sample Management Custodian or alternates against certain acceptance criteria as documented in the *SOP for Sample Receiving, Acceptance, and Log-In* (SMO-SMPL_REC). This policy is available to all sample management personnel for reference. Any samples, which deviate from these outlined areas, will be clearly flagged with the nature and substance of the deviation. Assessment and condition checks utilized by ALS Environmental-Simi Valley for the acceptance or rejection of samples are based on the criteria found in Appendix F, applicable Quality Assurance Project Plan (QAPP), permit, program or rule where appropriate. This verification of sample integrity is conducted by the Sample Custodian and may be dependent on the matrix (i.e., temperature, preservation, and headspace) being submitted.

Any abnormalities or departures from specified condition requirements (as described herein) as observed during the initial assessment are recorded. When there is any doubt as to the suitability of a sample for testing, including signs of damage, when a sample does not conform to the description provided, or when the test method required is not specified in sufficient detail the appropriate Project Manager (PM) is notified.

Non-Controlled

The Project Manager is to consult with the client, whenever possible, regarding specific integrity issues documented during sample receipt for further instructions before proceeding and retain a written record of discussion. There may be instances where the client is unavailable, in which case the PM shall document all attempts at contacting the client.

There may be a need to inform the client that a sample(s) is rejected and cannot be accepted for analysis into the laboratory. This situation includes, but is not limited to loss of sample or insufficient amount (subsampling may be performed if it would not cause loss of sample integrity, but the procedure must be indicated with the test results). Subsampling as in the case of air samples is not appropriate.

The procedures for sample documentation, handling acceptance requirements and deviations from the sample acceptance policy are discussed in detail in the *SOP for Sample Receiving, Acceptance and Log-In* (SMO-SMPL_REC). This procedure is also in place to ensure samples are received and properly logged into the laboratory, and that all associated sample documentation, including Chain-of-Custody (COC) records are complete and consistent with the samples received. All associated documentation, including chain of custody forms, memos, transmittal forms, and phone logs, are kept with each project file.

11.5 Sample Log-in

Each sample is logged into the laboratory in such a way as to ensure traceability and cross-reference with regards to the unique laboratory job number, sample identifications and client sample identifications. The laboratory identification is retained throughout the life of the sample in the laboratory. The identification system is designed and operated to ensure that samples cannot be confused physically or in laboratory documentation. Additional information is provided in the *SOP for Sample Receiving, Acceptance, and Log-In* (SMO_SMPL_REC).

11.6 Sample Custody

A sample is in someone's "custody" if:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's physical possession;
3. It is in one's physical possession and then locked up so that no one can tamper with it;
4. It is kept in a secured area, restricted to authorized personnel only.

Chain-of-Custody (COC) records are used to establish the legal custody of samples, showing the continuous possession of samples from sample collection and transportation to final destination at the laboratory. Custody of each sample is maintained from receipt through disposal (internally utilizing LIMS). When environmental samples are shipped to other laboratories for analysis, the sample management office follows formalized procedures for maintaining the chain of custody, which is written in SOPs for Sample Receiving, Acceptance and Login and Laboratory Storage, Analysis, and Tracking.

When samples are removed from the fixed lab and transported to the off-site extraction facility for sample preparation, internal chain of custody procedures still apply. When sample preparation is completed, sample extracts are returned to the laboratory.

Laboratory security and access is important in maintaining the integrity of samples received at ALS Environmental-Simi Valley.

Non-Controlled

Access to the building is limited to the reception area and sample receiving doors, which are manned during business hours and locked at all other times. In addition, the sample storage area within the laboratory is a controlled access area.

The laboratory is equipped with an alarm system which is monitored by a private security firm who provides nighttime and weekend security.

11.7 Sample Storage, Analysis and Tracking

The procedures and requirements for documenting the storage, analysis and tracking as well as maintaining integrity of samples are detailed in the *SOP for Laboratory Storage, Analysis, and Tracking* (ADM-LabSAT).

11.8 Sample Retention and Waste Disposal

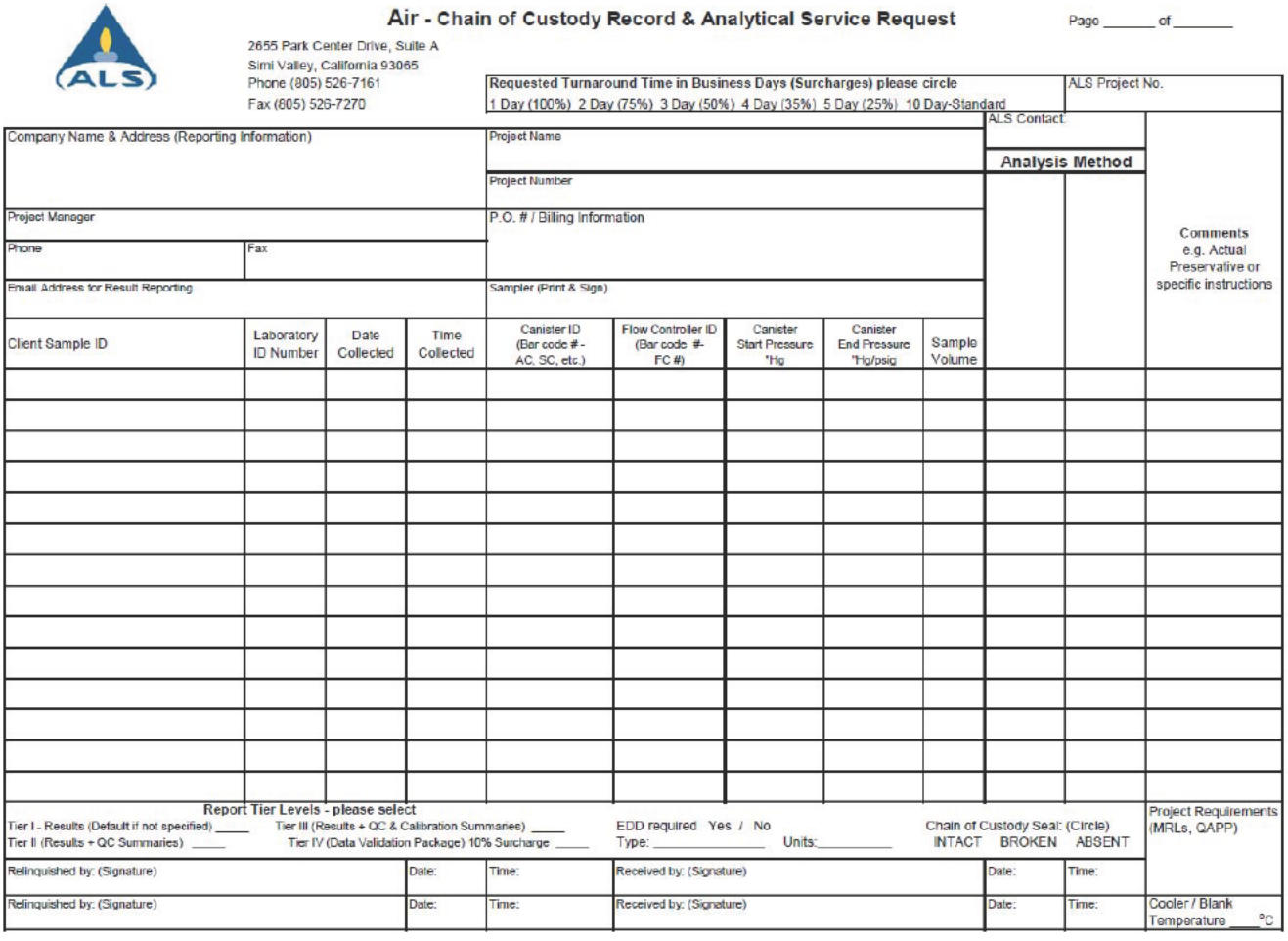
Upon completion of all analyses, the laboratory samples are retained in accordance with the requirements specified in the method SOPs and the *SOP for Waste Disposal* (DSP-Waste). The samples are disposed according to approved disposal practices or returned to the client (if applicable). All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. This evaluation is generally based on results from analyses performed on the sample by ALS Environmental-Simi Valley or an approved subcontract laboratory. It should be noted that all wastes produced at the laboratory, including the laboratory's own various hazardous waste streams, are treated in accordance with all applicable local, State and Federal laws. Complete documentation is maintained for samples from initial receipt through final disposal. This ensures an accurate record of the samples from "cradle to grave."

11.9 Intra-laboratory / Inter-laboratory Transfer of Samples

When environmental samples are shipped to another laboratory for analysis, samples are properly packed for shipment and preserved if necessary. Sample bottles are wrapped in protective material and placed in a plastic bag (preferably Ziploc®) to avoid any possible cross-contamination of samples during the transportation process. Blue or wet ice is used for temperature preservation, where necessary.

Non-Controlled

Figure 11-1
Air Chain of Custody Form



Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

ALS Contact:

Company Name & Address (Reporting Information)

Project Name

Project Number

Project Manager

P.O. # / Billing Information

Phone | Fax

Email Address for Result Reporting

Sampler (Print & Sign)

Analysis Method

Comments
e.g. Actual Preservative or specific instructions

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code #- FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume			

Report Tier Levels - please select

Tier I - Results (Default if not specified) _____ Tier III (Results + QC & Calibration Summaries) _____
Tier II (Results + QC Summaries) _____ Tier IV (Data Validation Package) 10% Surcharge _____

EDD required Yes / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank Temperature ____°C

Non-Controlled

Figure 11-2
Soil / Water Chain of Custody Form

Soil / Water - Chain of Custody Record & Analytical Service Request Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

ALS Contact:

Company Name & Address (Reporting Information)		Project Name		Analysis			
		Project Number					Comments
Project Manager		P.O. # / Credit Card / Billing Information					
Phone	Fax						
Email Address for Result Reporting							

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Water	Soil	Solid	Other				

Report Tier Levels - please select
Tier I - Results (Default if not specified) _____
Tier II (Results + QC Summaries) _____
Tier III (Results + QC & Calibration Summaries) _____
Tier IV (Data Validation Package) 10% Surcharge _____

EDD required Yes / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:	Cooler / Blank / Ice / No Ice Temperature _____ ℃

Non-Controlled

Figure 11-3

ALS Environmental
Sample Acceptance Check Form

Client: _____ Work order: _____
Project: _____
Sample(s) received on: _____ Date opened: _____ by: _____

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☐	☐	☐
2	Container(s) **supplied by ALS**?	☐	☐	☐
3	Did **sample containers** arrive in good condition?	☐	☐	☐
4	Were **chain-of-custody** papers used and filled out?	☐	☐	☐
5	Did **sample container labels** and/or tags agree with custody papers?	☐	☐	☐
6	Was **sample volume** received adequate for analysis?	☐	☐	☐
7	Are samples within specified holding times?	☐	☐	☐
8	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☐
9	Was a **trip blank** received?	☐	☐	☐
10	Were **custody seals** on outside of cooler/Box?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
	Were custody seals on outside of sample container?	☐	☐	☐
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☐
	Were signature and date included?	☐	☐	☐
	Were seals intact?	☐	☐	☐
11	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☐
12	**Tubes:** Are the tubes capped and intact?	☐	☐	☐
	Do they contain moisture?	☐	☐	☐
13	**Badges:** Are the badges properly capped and intact?	☐	☐	☐
	Are dual bed badges separated and individually capped and intact?	☐	☐	☐

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments

Explain any discrepancies: (include lab sample ID numbers): _____

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

Non-Controlled

12) Analytical Procedures

ALS Environmental employs methods and analytical procedures from a variety of external sources. Reference documents include but are not limited to: ASTM, CARB, NCASI, NIOSH, OSHA, SCAQMD, USEPA SW-846, USEPA 600/4-79-020, 600/4-91-010, 600/R-93/100 (inorganic substances), 600/625/R-96/010b (air samples), EPA 40 CFR part 136, and associated Supplements; US EPA Methods Update Rule effective 4/11/07 and *Standard Methods for the Examination of Water and Wastewater* for water and wastewater samples. Complete citations for these references can be found in Section 23. Other published procedures, such as state-specific methods, program-specific methods, or in-house methods may be used. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. The implementation of methods by ALS Environmental is described in SOPs specific to each method. A list of NELAP-accredited methods is given in Appendix J. Further details are described below.

12.1 Standard Operating Procedures (SOPs) and Laboratory Notebooks

ALS Environmental maintains SOPs for use in both technical and administrative functions (Refer to Appendix G). SOPs are written following standardized format and content requirements as described in the *SOP for Establishing Standard Operating Procedures* (CE-GEN009). Each SOP is reviewed and approved by a minimum of two managers (the Laboratory Director and/or Department Manager and the QA Manager). All SOPs undergo a documented annual review to make sure current practices are described. The QA Manager maintains a comprehensive list of current SOPs. The document control process ensures that only the most currently prepared version of an SOP is being used. The QA Manual, QAPPs, SOPs, standards preparation logbooks, maintenance logbooks, et al., are controlled documents, unless otherwise noted. The procedures for document control are described in the *SOP for Document Control* (CE-GEN005). In addition to SOPs, each laboratory department maintains a current file, accessible to all laboratory staff, of the current methodology used to perform analyses. Laboratory notebook entries are standardized following the guidelines in the *SOP for Making Entries onto Analytical Records* (CE-QA007). Entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval.

12.2 Modified Procedures

ALS Environmental strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Modifications to the published methods are listed in the standard operating procedure. Standard operating procedures are available to analysts and are also available to our clients for review, especially those for "Modified" methods. Client approval is obtained for the use of "Modified" methods prior to the performance of the analysis.

12.3 Analytical Batch

The basic unit for analytical quality control is the analytical batch. The definition that ALS Environmental-Simi Valley has adopted for the analytical batch is listed below. The overriding principle for describing an analytical batch is that all the samples in a batch, both field samples and quality control samples are to be handled exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner. The minimum requirements of an analytical batch are:

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1) The number of (field) samples in a batch is not to exceed 20.
2) All (field) samples in a batch are of the same matrix.
3) The QC samples to be processed with the (field) samples include:
   a) Method Blank (a.k.a. Laboratory Reagent Blank)

      Function: Determination of laboratory contamination

   b) Laboratory Control Sample

      Function: Assessment of method performance

   c) Matrix Spiked (field) Sample (a.k.a. Laboratory Fortified Sample Matrix)*

      Function: Assessment of matrix bias

   d) Duplicate Matrix Spiked (field) Sample or Duplicate (field) Sample (a.k.a. Laboratory Duplicate)*

      Function: Assessment of batch precision

   * A sample identified as a field blank, an equipment blank, or a trip blank is not to be matrix spiked or duplicated.
4) A single lot of reagents is used to process the batch of samples.
5) Each operation within the analysis is performed by a single analyst, technician, chemist, or by a team of analysts/technicians/chemists.
6) Samples are analyzed in a continuous manner over a timeframe not to exceed 24-hours between the start of processing of the first and last sample of the batch.
7) (Field) samples are assigned to batches commencing at the time that sample processing begins. For example: for analysis of metals, sample processing begins when the samples are digested. For analysis of organic constituents, it begins when the samples are extracted.
8) The QC samples are to be analyzed in conjunction with the associated field samples prepared with them. However, for tests which have a separate sample preparation step that defines a batch (digestion, extraction, etc.), the QC samples in the batch do not require analysis each time a field sample within the preparation batch is analyzed (multiple instrument sequences to analyze all field samples in the batch need not include re-analyses of the QC samples).
9) The batch is to be assigned a unique identification number that can be used to correlate the QC samples with the field samples.
10) Batch QC refers to the QC samples that are analyzed in a batch of (field) samples.
11) Project-specific requirements may be exceptions. If project, program, or method requirements are more stringent than these laboratory minimum requirements, then the project, program, or method requirements will take precedence. However, if the project, program, or method requirements are less stringent than these laboratory minimum requirements, these laboratory minimum requirements will take precedence.

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Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

12.4 Specialized Procedures

ALS Environmental not only strives to provide results that are scientifically sound, legally defensible, and of known and documented quality; but also strives to provide the best solution to analytical challenges. Procedures using specialized instrumentation and methodology have been developed to improve sensitivity (provide lower detection limits), selectivity (minimize interferences while maintaining sensitivity), and overall data quality for low concentration applications. Examples are specialized GC/MS analyses, and low level organics analyses (including PAHs, pesticides and PCBs).

12.5 Demonstration of Capability

A demonstration of capability (DOC) is made prior to using any new test method or when a technician is new to the method. This demonstration is made following regulatory, accreditation, or method specified procedures. In general, this demonstration does not test the performance of the method in real world samples, but in the applicable clean matrix free of target analytes and interferences.

A quality control sample material may be obtained from an outside source or may be prepared in the laboratory. The analyte(s) is (are) diluted in a volume of clean matrix (for analytes which do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples). Where specified, the method-required concentration levels are used. Four aliquots are prepared and analyzed according to the test procedure. The mean recovery and standard deviations are calculated and compared to the corresponding acceptance criteria for precision and accuracy in the test method or laboratory-generated acceptance criteria (if there are not established mandatory criteria). All parameters must meet the acceptance criteria. Where spike levels are not specified, actual Laboratory Control Sample results may be used to meet this requirement, provided acceptance criteria are met.

12.6 Method Detection Limits and Method Reporting Limits & Limits of Detection/ Quantitation

Method Detection Limits (MDL) for methods performed at ALS Environmental-Simi Valley are determined during initial method set up and if any significant changes are made. If an MDL study is not performed annually, the established MDL is verified by performing a limit of detection (LOD) verification on every instrument used in the analysis. The MDLs are determined by following the *SOP for Performing Method Detection Limits Studies and Establishing Limits of Detection and Quantitation* (CE-QA011), which is based on the procedure in 40 CFR Part 136, Appendix B. As required by NELAP and DoD protocols, the validity of MDLs is verified using LOD verification samples.

The Method Reporting Limit (MRL) is the lowest amount of an analyte in a sample that can be quantitatively determined with stated, acceptable precision and accuracy under stated analytical conditions (i.e. limit of quantitation - LOQ). LOQ are analyzed on an annual basis and cannot be lower than the lowest calibration standard. Current MDLs and MRLs are available from the laboratory.

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13) Measurement Traceability and Calibration

All equipment and instruments used at ALS Environmental are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below. Calibration verification is performed according to the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. Records are maintained to provide traceability of reference materials.

Traceability is defined as the property of a measurement result or value of a standard which can be related to stated references through an unbroken chain, each with stated uncertainties and is documented for all material used to perform calibrations. The documentation, a certificate of analysis containing, at a minimum, the manufacturer, address, accreditation number (where applicable), how traceability was achieved, the traceable values, their associated uncertainty, and the unique serial or laboratory identification number of the equipment or standard reference material (SRM) shall serve as initial point in the chain of traceability. The unique serial number or laboratory identification number is used throughout the laboratory to trace equipment and materials back to the original certificate of analysis.

Laboratory support equipment (thermometers, balances, and weights) are verified on an annual basis by a vendor accredited to ISO/IEC 17025:2005 International Standards. All analytical measurements generated at ALS Environmental are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. Vendors used for metrology support are required to verify compliance to International Standards by supplying the laboratory with a copy of their scope of accreditation.

Equipment subjected to overloading or mishandling, or has been shown by verification to be defective, is taken out of service and labeled until repaired. That piece of equipment is placed back in service only after verifying, by calibration, that it performs satisfactorily.

13.1 Temperature Measuring Devices

All thermometers are identified by a unique identifying number (i.e., serial number), and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. All corresponding correction factors are noted on the device as well as in the thermometer calibration logbook. The NIST calibrated thermometer is recertified by an approved vendor accredited ISO/IEC 17025:2005 International Standard on an annual basis and certificates are retained on file for review. All temperature monitoring is conducted in accordance with the *SOP for Sample Receipt, Acceptance and Log-In* (SMO-SMPL_REC) and thermometer calibration requirements are performed in accordance with the *SOP for Calibration and Use of the Laboratory Support Equipment* (ADM-SupEQ).

A number of thermometers include a temperature range per certain project requirements (complies with Department of Defense Quality Systems Manual for Environmental Laboratories); this range is recorded to document consistent compliance with required temperatures for refrigerators and freezers, where applicable.

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13.2 Volumetric Dispensing Devices

The accuracy of pipettes used to make critical-volume measurements is verified on a quarterly basis. Typically, the indicated volume or range (where applicable) of the pipette is checked and both the accuracy and precision verification are performed using the above-mentioned procedure. The calibrations are evaluated against the intended use (volume or range) of the pipette and if the calibration is not approved for the specified volume(s) it is tagged accordingly (i.e. "Do Not Use Below 5uL"). The results for all calibration verifications are recorded and maintained.

Note: Glass microliter syringes including gas-tight syringes are considered in the same manner as Class A glassware and are not held to the calibration/verification requirements as are other volumetric dispensing devices.

13.3 Analytical Balances and Weights

Analytical balances and weights are calibrated/recertified and certificates issued annually by an approved vendor accredited to ISO/IEC 17025:2005 International Standard. The calibration of each balance is checked once each day of use in the expected range, utilizing the calibrated weights. Bound record books are kept which contain the identification of balance (serial number), recorded measurements and the initials of the analyst who performed the check. All certificates for the balances and weights are available for review.

13.4 Pressure/Vacuum Gauges

ALS Environmental-Simi Valley digital pressure/vacuum gauges are used in a number of critical measurements within the laboratory. The following is a list of the uses for this gauge type.

- Canister cleaning and conditioning
- Measure the vacuum on canisters before they are sent to the client for sampling.
- Measure the initial/final vacuum/pressure of canisters prior to analysis.
- Measure pressure during the preparation of selected standards.

Digital pressure/vacuum gauges are calibrated and certificates issued once per year by an approved metrology organization. All calibrations are performed against standards traceable to the National Institute of Standards and Technology (NIST) or other recognized national metrology institutes. In addition, ALS Environmental-Simi Valley performs a calibration check for each gauge six months following the calibration date. The laboratory retains all corresponding calibration and verification documentation for review.

13.5 Source and Preparation of Standards and Reference Materials

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. ALS Environmental-Simi Valley relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., etc. are examples of the vendors used. Reference material information is recorded in the appropriate logbook(s) and materials are stored under conditions that provide maximum protection against deterioration and contamination.

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The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries onto Analytical Records* (CE-QA007). Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material.

13.6 Instrument Calibration

The laboratory specifies the procedures and documentation for initial instrument calibration and continuing calibration verification in the applicable method standard operating procedures to ensure that data is of known quality and is appropriate for a specific regulation and/or client requirement. The procedural steps for calibration including, frequency, number of points, integration, calculations, acceptance criteria (appropriate to the calibration technique employed), corrective action, associated statistics, and data qualifications are included in applicable methods, method standard operating procedures and/or client project plans. The essential elements that define the procedures and required documentation for initial instrument calibrations are specified below.

- Sufficient raw data records are retained to permit reconstruction of all calibrations.
- If a reference or mandated method does not specify the number of calibration standards, the initial calibration range shall consist of a minimum of 5 contiguous calibration points for organics and a minimum of 3 contiguous calibration points for inorganics. The actual numbers of points utilized is specified in the corresponding method SOP.
- The concentrations should bracket the expected concentration range of samples.
- Initial instrument calibration procedures referenced in test methods (either directly or indirectly) are readily available to the analysts.
- All sample results are quantitated from the initial instrument calibration and are not quantitated from any continuing instrument calibration verification unless otherwise specified by regulation, method or program.
- The initial instrument calibration is verified with a standard obtained from a second manufacturer or lot and traceability to a national standard is maintained, where available.
- The acceptance criteria utilized is appropriate for the calibration technique employed.
- The lowest calibration standard in the initial calibration is at or below the lowest concentration for which quantitative data are to be reported and is referred to at this laboratory as the method reporting limit (MRL). Some programs and/or agencies refer to this limit as the practical quantitation limit (PQL) or Limit of Quantitation (LOQ).
- Any data reported below the MRL or above the highest calibration standard is considered to have an increased quantitative uncertainty and is appropriately qualified in the report.

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- The lowest calibration standard is above the limit of detection or method detection limit (MDL).

13.7 Internal and External Calibrations

Internal standard calibration involves the comparison of instrument responses from the target compounds in the sample to the responses of specific standards added to the sample or sample extract prior to injection. The ratio of the peak area of the target compound in the sample or sample extract to the peak area of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard. The ratio is termed the response factor (RF) or relative response factor (RRF) in some methods.

External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas are compared to peak areas of the standards. The ratio of the detector responses to the amount (mass) of analyte in the calibration standard is defined as the calibration factor or in some cases it may be referred to as response factor.

13.8 Continuing Calibration Verification

The essential elements that define the procedures and required documentation for continuing instrument calibration verification are specified below.

- When an initial calibration is not performed on the day of analysis, continuing instrument calibration verification is analyzed with each batch.
- Calibration is verified for each reported compound, element or parameter; however, for multi-component analytes such as aroclors or total petroleum hydrocarbons a representative chemical related substance or mixture may be used. The allowance for this exception is dependent on applicable regulatory, method, or client project plans.
- Generally, the instrument calibration verification is performed at the beginning, end, and every ten samples of each analytical batch (except, if an internal standard is used, only one verification needs to be performed at the beginning of the analytical batch); whenever it is suspected that the analytical system may be out of calibration; if the time period for calibration or most previous calibration verification has expired; or for analytical systems that contain a specific calibration verification requirement. Specific requirements for the frequency of continuing calibration verification, for a particular method, is specified in the corresponding method standard operating procedure.

14) Assuring the Quality of Results

A primary focus of ALS Environmental's QA Program is to ensure the accuracy, precision and comparability of all analytical results. Prior to using a procedure for the analysis on field samples, acceptable method performance is established by performing demonstration of capability analyses. Performance characteristics are established by performing method detection limit studies and assessing accuracy and precision according to the reference method. ALS Environmental has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated. These QC limits are either specified in the test methodology or are statistically derived based on the laboratory's historical data. Quality Control objectives are defined below.

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14.1 Quality Control Objectives

14.1.1 Accuracy - Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (% REC.) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination).

ALS Environmental utilizes several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

14.1.2 Precision - Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis. The American Society of Testing and Materials (ASTM) recognizes two levels of precision: repeatability - the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions, and reproducibility - the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

"Within-batch" precision is measured using replicate sample or QC analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches.

14.1.3 Control Limits - The control limits for accuracy and precision originate from two different sources. For analyses having enough QC data, control limits are calculated at the 99% confidence limits. For analyses not having enough QC data, or where the method is prescriptive, control limits are taken from the method on which the procedure is based. If the method does not have stated control limits, then control limits are assigned method-default or reasonable values. Control limits are updated periodically when new statistical limits are generated for the appropriate surrogate, laboratory control sample, and matrix spike compounds (typically once a year) or when method prescribed limits change. The updated limits are reviewed by the QA Manager. The new control limits replace the previous limits and data is assessed using the new values. Current acceptance limits for accuracy and precision are available from the laboratory. For inorganics, the precision limit values listed are for laboratory duplicates. For organics, the precision limit values listed are for duplicate laboratory control samples or duplicate matrix spike analyses.

Non-Controlled

14.1.4 Representativeness - Representativeness is the degree to which the field sample, being properly preserved, free of contamination, and analyzed within holding time, represents the overall sample site or material. This can be extended to the sample itself, in that representativeness is the degree to which the subsample that is analyzed represents the entire field sample submitted for analysis. ALS Environmental has sample handling procedures to ensure that the sample used for analysis is representative of the entire sample. Further, analytical SOPs specify appropriate sample handling and sample sizes to further ensure the sample aliquot that is analyzed is representative in entire sample. Air samples received by the laboratory in canisters and bags are considered to be homogenous and therefore, no special sample preparation procedures are necessary.

14.1.5 Comparability – Comparability expresses the confidence with which one data set can be compared to another and is directly affected by data quality (accuracy and precision) and sample handling (sampling, preservation, etc). Only data of known quality can be compared. The objective is to generate data of known quality with the highest level of comparability, completeness, and usability. This is achieved by employing the quality controls listed below and standard operating procedures for the handling and analysis of all samples. Data is reported in units specified by the client and using ALS Environmental or project-specified data qualifiers.

14.2 Quality Control Procedures

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures and listed below. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below.

14.2.1 Method Blank (a.k.a. Laboratory Reagent Blank)

The method blank is an analyte-free matrix (air, water, soil, etc.) subjected to the entire analytical process. When analyte-free soil is not available, anhydrous sodium sulfate, organic-free sand, or an acceptable substitute is used. The method blank is analyzed to demonstrate that the analytical system itself does not introduce contamination. The method blank results should be below the Method Reporting Limit (MRL) or, if required for DoD projects, < ½ MRL for the analyte(s) being tested. Otherwise, corrective action must be taken. A method blank is included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

14.2.2 Calibration Blanks

For some methods, calibration blanks are prepared along with calibration standards in order to create a calibration curve. Calibration blanks are free of the analyte of interest and, where applicable, provide the zero point of the calibration curve. Additional project-specific requirements may also apply to calibration blanks.

14.2.3 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of analyte-free water, reagent, or solvent that are analyzed in order to verify the system is contamination-free when CCV standards are analyzed.

Non-Controlled

The frequency of CCB analysis is once every ten samples or as indicated in the method, whichever is greater. Additional project-specific requirements may also apply to continuing calibration blanks.

14.2.4 Calibration Standards

Calibration standards are vapors, liquids or solutions of known concentration prepared from primary standard or stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

14.2.5 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration but *prior to* sample analysis, in order to verify the validity and accuracy of the standards used for calibration. Once it is determined that there is no defect or error in the calibration standard(s), standards are considered valid and may be used for subsequent calibrations and quantitative determinations (as expiration dates and methods allow). The ICV standards are prepared from materials obtained from a source independent of that used for preparing the calibration standards ("second-source"). ICVs are also analyzed in accordance with method-specific requirements.

14.2.6 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method.

14.2.7 Internal Standards

Internal standards are known amounts of specific compounds that are added to each sample prior to instrument analysis. Internal standards are generally used for GC/MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by matrix effects. The requirements for evaluation of internal standards are specified in each method and SOP.

14.2.8 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

Non-Controlled

14.2.9 Laboratory Control Samples

The laboratory control sample (LCS) is an aliquot of analyte-free liquid, solid or air matrix to which known amounts of the method analyte(s) is (are) added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. The LCS sample is prepared and analyzed in exactly the same manner as the field samples.

The percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy.

Recovery (%) = (M/T) x 100

Where: M = The measured concentration of analyte,
T = The theoretical concentration of analyte added.

14.2.10 Laboratory Fortified Blanks - LFB

A laboratory blank fortified at the MRL used to verify the minimum reporting limit. The LFB is carried through the entire extraction and analytical procedure. A LFB is required with every batch of drinking water samples.

14.2.11 Matrix Spikes (a.k.a. Laboratory Fortified Sample Matrix)

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) is (are) added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. For the appropriate methods, matrix spiked samples are prepared and analyzed and at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as follows:

Recovery (%) = (S - A) x 100 ÷ T

Where: S = The observed concentration of analyte in the spiked sample,
A = The analyte concentration in the original sample, and
T = The theoretical concentration of analyte added to the spiked sample.

Note: Matrix spiked samples are often not feasible for air matrices. Therefore, the MS shall be used as required by the test method and as specified by the corresponding method SOP.

14.2.12 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample.

Non-Controlled

Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and duplicate matrix spiked sample (MS/DMS) are analyzed. The relative percent difference between duplicate analyses or between an MS and DMS is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as follows:

$$\textit{Relative Percent Difference (RPD)} = (S1 - S2) \times 100 \div S_{ave}$$

Where S1 and S2 = The observed concentrations of analyte in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike, and

S_{ave} = The average of observed analyte concentrations in the sample and its duplicate, or in the matrix spike and its duplicate matrix spike.

Depending on the method of analysis, either duplicates (and/or matrix spikes) or MS/DMS analyses are performed at a minimum frequency of one set per 20 samples. If an insufficient quantity of sample is available to perform a laboratory duplicate or duplicate matrix spikes, duplicate LCSs will be prepared and analyzed.

14.2.13 Control Charting

The generation of control charts is routinely performed at ALS Environmental. Surrogate, Matrix Spike and LCS recoveries are all monitored and charted. In addition, the laboratory also monitors the Relative Percent Difference (RPD) measurement of precision. Control charts are available to each individual laboratory unit to monitor the data generated in its facility using control charts that have been programmed to identify various trends in the analytical results. If trends in the data are perceived, various means of corrective action may then be employed in order to prevent future problems with the analytical system(s). Finally, data quality reports using control charts are generated for specific clients and projects pursuant to contract requirements. The control charting procedure is described in the SOP for *Control Limits* (CE-QA009).

14.2.14 Glassware Washing

Glassware washing and maintenance play a crucial role in the daily operation of a laboratory. The glassware used at ALS Environmental undergoes a rigorous cleansing procedure prior to every usage. The *SOP for Glassware Cleaning* (ADM-GLASS) has been generated and outlines the various procedures used at ALS Environmental-Simi Valley; each procedure is specific to the end-use of the equipment as well as to the overall analytical requirements of the project. In addition, other equipment that may be routinely used at the laboratory is also cleaned following instructions in the appropriate SOP.

14.2.15 Collection Efficiency

In the case of sampling trains (consisting of one or more multi-section sorbent tubes), which are received intact by the laboratory, the “front” and “back” sections shall be separated if required by the client. Each section shall be processed and analyzed separately and the analytical results reported accordingly.

Non-Controlled

14.2.16 Desorption Efficiency and Method Reporting Limits (Industrial Hygiene)

Desorption efficiency (DE) is the ability of an analytical method to recover the analyte from the collection media. Desorption efficiencies are determined initially and for each analyte to be reported. In addition, a DE study is performed each time there is a change in the test method, or with each new lot of media. Desorption efficiency shall be determined using sorbent media from the same lot number used for the field samples, if possible, and of the identical size and type. The DE values are used to correct the sample results (for all samples except passive samplers) before reporting.

Minimum reporting limits for each reportable analyte are determined initially by the analysis of spiked media, prepared at the desired reporting limit and carried through the entire analytical process. The reporting limit is verified or re-established annually (or if there is a change in methodology or instrumentation) and instrument performance is checked with each analytical batch through the analysis of an analytical standard prepared at the reporting limit.

14.2.17 Field and Trip Blanks

Field and trip blanks are analyzed when they are submitted to the laboratory for analysis. The actual field samples are flagged (when analytes are found in the blank) if and only if the laboratory is able to analyze the samples in the same analytical sequence as the corresponding field or trip blank. If this is not possible due to client submission restrictions then the results for the samples and blanks shall be reported independently with no flag. However, an explanation of this is included in the final report. This laboratory does not feel that Summa canisters are suitable for use as trip blanks. It is for this reason that the results for these types of containers are reported as separate samples and flagging is not considered appropriate.

14.3 Uncertainty

When requested by the client or relevant to the validity of reported results, the estimation of measurement uncertainty will be provided to a client or regulatory agency. How the uncertainty will be reported may be dictated by the client's reporting specifications. Procedures for determining and reporting uncertainty are given in the *SOP for Estimation of Uncertainty of Analytical Measurements* (CE-QA010).

15) Control of Non-Conforming Environmental Testing Work

If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s) (See Appendix H). Failure to meet established analytical controls, such as the quality control objectives, prompts corrective action. Corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, team leader, department manager, and/or the QA Manager may examine and pursue alternative solutions. In addition, the appropriate Project Manager is notified in order to ascertain if the client needs to be notified.

Non-Controlled

16) Corrective Action, Preventive Action, and Improvement

The laboratory takes all appropriate steps necessary to ensure all sample results are reported with acceptable quality control results. When sample results do not conform to established quality control procedures, responsible management will evaluate the significance of the nonconforming work and take corrective action to address the nonconformance.

Nonconforming events such as errors, deficiencies, deviations from SOP, proficiency (PT) failure or results that fall outside of established QC limits are documented using a *Nonconformity and Corrective Action Report* form. The procedure and responsibilities for addressing nonconforming work is defined in the *SOP for Nonconformance and Corrective Action* (CE-QA008). Nonconformances are reported to the client using various means (voice, email, narrative, etc). When a nonconformance occurs that casts doubt on the validity of the test results or additional client instructions are needed, the Project Manager notifies the client the same business day that the nonconformance is confirmed and reported. The QA Manager reviews each problem, ensuring that appropriate corrective action has been taken by the appropriate personnel. The Nonconformity and Corrective Action Report (NCAR) is filed in the associated service request file and a copy is kept by the QA Manager. The QA Manager periodically reviews all NCARs looking for chronic, systematic problems that need more in-depth investigation and alternative corrective action consideration. In addition, the appropriate Project Manager is promptly notified of any problems in order to inform the client and proceed with any action the client may want to initiate.

Part of the corrective action process involves determining the root cause. Identifying the root cause of a nonconformance can be difficult, but important for implementing effective corrective action. Root cause principles are used to determine assignable causes, which leads to corrective action taken to prevent recurrence.

16.1 Preventive Action and Improvement

Various preventive action and improvement processes are used for eliminating potential problems or averting problems before they occur. This is explained in the *SOP for Preventive Action* (CE-GEN004).

Non-Controlled

Table 16-1

Equipment Maintenance Procedures

Instrument	Applicable Activity	Frequency	Performed
Gas Chromatographs	Replace septum	As required	In-House and Outside Vendor
	Check system for gas leaks, loose/fray wires and insulation	With cylinder change/Open system	
	Replace injection port liner	As required	
	ECD wipe test	Every 6 months	
	Thermally Clean ECD	As needed	
	Clean FID	As required	
	Change TCD assembly	As required	
	SCD – Change reaction tube	As required	
	Catalyst check	As required	
Gas Chromatography / Mass Spectrometers	Tune MSD	As needed	In-House and Outside Vendor
	Change Semi-VOA capillary column	As needed	
	Change Semi-VOA injection port septum	As required	
	Change Semi-VOA injection port liner	As required	
	Replace trap (VOA)	As required	
	Clean ion source	As required	
	Change filament	As required	
	Change electron multiplier	As required	
	Vacuum System: • Mechanical pumps: change oil, change trap pellets (HP only) • Diffusion pump: check oil, check cooling fan, change oil • Turbo pump	• Check every 6 months, check level monthly, change at least annually or sooner is necessary • As required • Replace as required	In-House
	Air Preconcentrators / Autosampler: • Change traps • Inspect Rotors • Calibrate Mass Flow Controllers	• As required • As required • Every 6 months	In-House

Non-Controlled

Instrument	Applicable Activity	Frequency	Performed
HPLC	Replace/clean check valve filter	As required	In-House
	Replace lamp UV/vis detector	As required	
	Replace flow cell	As required	
	Check flow	Quarterly	
Analytical Balances	Clean pan and compartment	Prior to and after use	In-House and Outside Vendor
	Check with NIST traceable weights	Prior to use	
	Field service	Annually	
Refrigerators and Freezers	Monitor Temperature	Daily	In-House
	Adjust Temperature	As required	
	Clean, Defrost	As required	
Ovens	Clean	As needed or if temperature is outside limit	In-House
pH probes	Condition probe	When fluctuations occur	In-House
	Change Filling Solution	Weekly	
Fluoride ISE	Store in storage solution	Between uses	In-House
Ammonia ISE	Store in storage solution	Between uses	In-House
UV-visible Spectrophotometer	Wavelength check	Annually	In-House
Ion Chromatographs	Change column bed supports	Monthly or as needed	In-House
	Clean column	Monthly or as needed	
	Change column	Every six months or as needed	
	Change valve port face and hex nut	Every six months or as needed	
	Clean valve slider	Every six months or as needed	
	Change tubing	Annually or as needed	
	Eluent pump	Annually	
Restek Thermal Gas Purifier	Check getter tube	Monthly, change as required	In-House

Non-Controlled

17) Control of Records

17.1 Documentation

ALS Environmental maintains a records system which ensures that all laboratory records of analysis data are retained and available. Analysis data is retained for 5 years from the report date unless contractual terms or regulations specify a longer retention time. Archival procedures are described in the *SOP for Data and Record Archiving* (ADM-ARC).

17.1.1 Documentation and Archiving of Sample Analysis Data

The archiving system includes, but is not limited to, the following items (where applicable) for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate) and analysis;
- Instrument parameters (or reference to the data acquisition method);
- Sample analysis sequence;
- Instrument printouts, including chromatograms and peak integration reports for all samples, standards, blanks, spikes, duplicates and reruns;
- Applicable standard identification numbers;
- Chain of custody, service request and sample acceptance check forms;
- Initial calibration and data review checklist(s);
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

For organics analysis, data applicable to all analyses within the batch, such as GCMS tunes, CCVs, batch QC, and analysis sequences; are kept using a separate documentation system. This system is used to archive data on a batch-specific basis and is segregated according to the date of analysis. This system also includes results for the most recent calibration curves, as well as method validation results.

17.2 Information Technology

The generation, compilation, reporting, and archiving of electronic data is a critical component of laboratory operations. In order to generate data of known and acceptable quality, the quality assurance systems and quality control practices for electronic data systems must be complete and comprehensive and in keeping with the overall quality assurance objectives of the organization. ALS Environmental management provides the tools and resources to implement electronic data systems and establishes information technology standards and policies.

17.2.1 Software Quality Assurance

Practices are defined for assuring the quality of the computer software used throughout all laboratory operations to generate, compile, report, and store electronic data. These practices are described in the *SOP for Software and Data Quality Assurance* (ADM-SftwreQA).

Non-Controlled

The purpose of the SOP is to describe the policies and practices for the procurement, configuration management, development, validation and verification, data security, maintenance, and use of computer software. The policies and practices described in the plan apply to purchased computer software as well as to internally developed computer software. Key components of this plan are policies for software validation and control.

17.2.2 IT Support

The local ALS Environmental Information Technology (IT) department is established to provide technical support for all computing systems. The IT department staff continually monitors the performance and output of operating systems. The IT department oversees routine system maintenance and data backups to ensure the integrity of all electronic data described in the *SOP for Electronic Data Backup, Archiving, and Restoration* (ADM-DATA_BU). A software inventory is maintained. Additional IT responsibilities are described in the *SOP for Software and Data Quality Assurance* (ADM-SftwreQA).

In addition to the local IT department, ALS Environmental corporate IT provides support for network-wide systems. ALS Environmental also has personnel assigned to information management duties such as development and implementation of reporting systems; data acquisition, and Electronic Data Deliverable (EDD) generation.

17.2.3 Information Management Systems

ALS Environmental has various systems in place to address specific data management needs. The Laboratory Information Management System (LIMS) is used to manage sample information and invoicing. Access is controlled by password. This system defines sample identification, analysis specifications, and provides a means of sample tracking. This system is used during sample login to generate the internal service request.

Included on the service request is a summary of client information, sample identification, required analyses, work instructions, and deliverable requirements. The LIMS is used to track the status of a sample and is important in maintaining internal chain of custody.

Where possible, instrument data acquired locally is immediately moved to a server (Microsoft Windows Server 2008 R2). This provides a reliable, easily maintained, high-volume acquisition and storage system for electronic data files. With password entry, users may access the system from many available computer stations, improving efficiency and flexibility. The server is also used for data reporting, EDD generation, and administrative functions. Access to these systems is controlled by password. A standardized EDI (electronic data interchange) format is used as a reporting platform, providing functionality and flexibility for end users. With a common standardized communication platform, the EDI provides data reporting in a variety of hardcopy and electronic deliverable formats.

17.2.4 Backup and Security

Laboratory data is either acquired directly to the centralized acquisition server or acquired locally and then transferred to the server. All data is eventually moved to the centralized data acquisition server for reporting and archiving.

Non-Controlled

Full backups onto a hard drive are performed on all file server information once per day. In addition, the laboratory's data warehouse located in Canada performs an offsite full backup nightly.

Access to sample information and data is on a need-to-know basis. Access is restricted to the person's areas of responsibility. Passwords are required on all systems. No direct external, non-ALS Environmental access is allowed to any of our network systems.

The external e-mail system and Internet access is established via a single gateway to discourage unauthorized entry. ALS Environmental uses a closed system for company e-mail. Files, such as electronic deliverables, are sent through the external e-mail system only via a trusted agent or comparable service. The external messaging system operates through a single secure gateway. E-mail attachments sent in and out of the gateway are subject to a virus scan. Because the Internet is not regulated, we use a limited access approach to provide a firewall for added security. Virus screening is performed continuously on all network systems with Internet access.

18) Audits

Quality audits are an essential part of ALS Environmental-Simi Valley's quality assurance program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the QA program, while Performance Audits are conducted by analyzing proficiency testing samples in order to quantitatively evaluate the outputs of the various measurement systems.

18.1 System Audits

The system audit examines the presence and appropriateness of laboratory systems. External system audits of ALS Environmental-Simi Valley are conducted regularly by various regulatory agencies and clients. Appendix J lists the certification and accreditation programs in which ALS Environmental-Simi Valley participates. Programs and certifications are added as required. Additionally, internal system audits of ALS Environmental-Simi Valley are conducted regularly under the direction of the QA Manager. The internal audit procedures are described in the *SOP for Internal Audits* (CE-QA001). The internal audits are performed as follows:

- Comprehensive lab-wide system audit – performed annually. This audit is conducted such that all elements of the ALS Quality System are assessed.
- Technical/method audits
- Hardcopy report audits

All audit findings, and corrective actions are documented. The results of each audit are reported to the Laboratory Director and Department Managers for review. Any deficiencies identified are summarized in the audit report. Managers must respond with corrective actions correcting the deficiency within a defined timeframe. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification within the corrective action period (if not already provided).

Non-Controlled

Electronic data audits may be performed in conjunction with hardcopy data audits. The electronic audits focus on organic chromatographic data and include an examination of audit trails, peak integrations, calibration practices, GCMS tuning data, peak response data, use of appropriate files, and other components of the analysis. The audit also verifies that the electronic data supports the hardcopy reported data.

Additional internal audits or data evaluations may be performed as needed to address any potential data integrity issues that may arise.

18.2 Performance Audits

ALS Environmental-Simi Valley also participates in the analysis of interlaboratory proficiency testing (PT) samples. Participation in PT studies is performed on a regular basis and is designed to evaluate all analytical areas of the laboratory. General procedures for these analyses are described in the *SOP for Proficiency Sample Testing Analysis* (CE-QA006). ALS Environmental-Simi Valley routinely participates in the following studies:

- American Industrial Hygiene Association (AIHA) PT Program, 4 per year
- Air and Emissions PT studies, 2 per year
- Other studies as required for specific certifications, accreditations, or validations.

PT samples are processed by entering them into the LIMS system as samples (assigned Service Request, due date, testing requirements, etc.) and are processed the same as field samples. The laboratory sections handle samples the same as field samples, performing the analyses following method requirements and performing data review. The laboratory sections submit results to the QA Manager for subsequent reporting to the appropriate agencies or study provider. Results of the performance evaluation samples and audits are reviewed by the QA Manager, Laboratory Director, the laboratory staff, and the Corporate Quality Assurance Manager. For any results outside acceptance criteria, the analysis data is reviewed to identify a root cause for the deficiency, and corrective action is taken and documented through nonconformance (NCAR) procedures.

19) Management Review

Quality assurance requires an active, ongoing commitment by ALS Environmental personnel at all levels of the organization. Communication and feedback mechanisms are designed so that analysts, supervisors and managers are aware of QA issues in the laboratory. Analysts performing routine testing are responsible for generating a data quality narrative or data review document with every analytical batch processed. This report also allows the analyst to provide appropriate notes and/or a narrative if problems were encountered with the analyses. A Non-Conformity and Corrective Action Report (NCAR) may also be initiated. Supervisors or qualified analysts review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and addressed.

It is the responsibility of each laboratory unit to provide the reporting department with reviewed data accompanied by signature approval. The data validation coordinators provide the Project Manager with a final report of the data. Footnotes and/or narrative notes must accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate Project Manager, who in turn reviews the entire collection of analytical data for completeness and to ensure that any and all client-specified objectives were successfully achieved. A case narrative is written (or approved) by the Project Manager to explain any unusual problems with a specific analysis or sample, etc.

Non-Controlled

The QA Manager provides overview support to the Project Managers as required (e.g., contractually specified, etc.). The QA Manager is also responsible for the oversight of all internal and external audits, for all proficiency testing sample and analysis programs, and for all laboratory certification/accreditation responsibilities. The QA Manager regularly communicates with the Laboratory Director to review the various QA/QC activities, priorities, and status of program implementation; including such topics as the following:

- Status, schedule, and results of internal and external audits;
- Status, schedule, and results of internal and external proficiency testing studies;
- Status of certifications, accreditations, and approvals;
- Status of QA Manual and SOP review and revision;
- Status of MDLs studies;
- Discussion of QC problems in the laboratory;
- Discussion of corrective action program issues;
- Status of staff training and qualification; and
- Other topics as appropriate.

An annual management review of the quality and testing systems is performed as described in the *SOP for Laboratory Management Review* (CE-QA005). This is done to identify any necessary changes or improvements to the quality system or quality assurance policies. This review is documented in a Managerial Review of the Laboratory's Quality Systems and Testing Activities and sent to senior management.

20) Personnel

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the Human Resources personnel and are available for review. In order to assess the technical capabilities and qualifications of a potential employee, all candidates for employment at ALS Environmental are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at ALS Environmental when the company policies are presented and discussed. Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all training processes at ALS Environmental. Safety training begins with reading the *Environmental Health and Safety Manual.* Employees are also required to participate in periodic safety training performed by the Environmental, Health and Safety Coordinator.

Employees are responsible for complying with the requirements of the QA Manual and QA/QC requirements associated with their function(s). Quality Systems training begins with Quality Assurance orientation for new employees and reading the Quality Assurance Manual. During the employee's first month, the employee receives Ethics training and learns about ALS Environmental quality systems. Each employee participates in annual Ethics Refresher training, which is part of the ALS Environmental Improper Practices Prevention Program.

ALS Environmental also encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the Company. Ongoing training occurs for all employees through a variety of mechanisms. The corporate, company-wide training and development program, external and internal technical seminars and training courses, and laboratory-specific training exercises are all used to provide employees with professional growth opportunities.

Non-Controlled

All technical training is documented and records are maintained by the QA department. Training requirements and its documentation are described in the *SOP for Training Policy* (CE-QA003). A training plan is developed whenever an employee starts a new procedure or new position. The training plan includes a description of the step-by-step process for training an employee and for initial demonstration of capability. Where the analyst performs the entire procedure, a generic training plan may be used.

20.1 Initial Demonstration of Capability (IDOC)

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the applicable Demonstration of Capability analysis qualifies the analyst to perform the method independently. Demonstration of Capability is performed by one of the following:

- Successful completion of an Initial Precision and Recovery (IPR) study (required where mandated by the method).
- Analysis of 4 consecutive Laboratory Control Samples, with acceptable accuracy and precision.
- Where spiking is not possible but QC standards are used ("non-spiked" Laboratory Control Samples), analysis of 4 consecutive Laboratory Control Samples with acceptable accuracy and precision.
- Where one of the three above is not possible training is performed and supervisor approval is documented.

A flowchart identifying the Demonstration of Proficiency requirements is given in Figure 20-1. The flowchart identifies allowed approaches to assessing Demonstration of Capability when a 4-replicate study is not mandated by the method, when spiking is not an option, or when QC samples are not readily available.

20.2 Continuing Demonstration of Proficiency

A periodic demonstration of proficiency is required to maintain continuing qualification. Continuing Demonstration of Proficiency is required each year, and may be performed one of the following ways:

- Successful performance on external (independent) single-blind sample analyses using the test method, or a similar test method using the same technology. I.e. PT sample or QC sample blind to the analyst.
- Performing Initial Demonstration of Capability as described above, with acceptable levels of precision and accuracy.
- Analysis of at least 4 consecutive LCSs with acceptable levels of accuracy and precision from in-control analytical batches.
- If the above cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.
- For methods for which PT samples are not available and a spiked analysis (LFB, MDL, etc.) is not possible, analysis of field samples that have been analyzed by another analyst with statistically indistinguishable results.

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20.3 Documentation of Training

Records are maintained to indicate the employee has the necessary training, education, and experience to perform their functions. Information of previously acquired skills and abilities for a new employee is maintained in Human Resources personnel files and ALS Environmental resumes. QA maintains a database to record the various technical skills and training acquired while employed by ALS Environmental. Information includes the employee's name, a description of the skill including the appropriate method and SOP reference, the mechanism used to document proficiency, and the date the training was completed. General procedures for documenting technical training are described in the *SOP for Training Policy* (CE-QA003).

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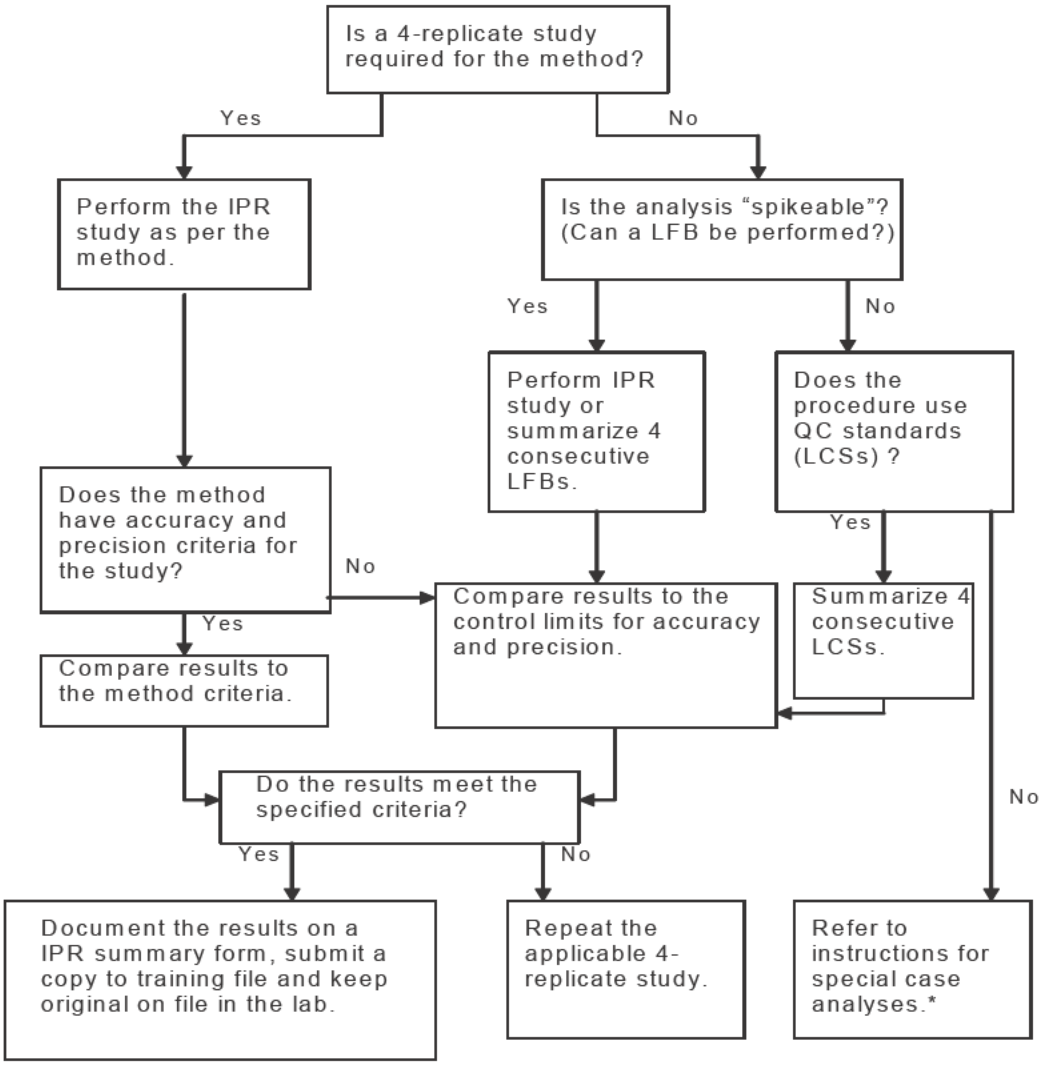
Figure 20-1
Initial Demonstration of Capability Requirements[a]



[a] For IDOC IPR or LFB studies, "second-source" reference materials are used, as per TNI/NELAP requirements
* Refer to the SOP for Training Policy for details. References for Quality Systems, External Documents, Manuals, Standards, and Analytical Procedures

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21) Reporting of Results

ALS Environmental reports the analytical data produced in its laboratories to the client via the certified analytical report. This report includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

21.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). The hardcopy version of the data is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the hardcopy is forwarded to the supervisor or second qualified analyst, who reviews the data for errors. Where calculations are not performed using a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable it is turned into the reporting department where final reports are generated and then validated by a Data Validation Coordinator. The hardcopy or electronic final report is physically or electronically signed by the project manager and the final report may be stored electronically or in hardcopy format. Test analysis data shall be kept in the appropriate service request folder. Data review and reporting procedures are described in the *SOP for Data Review and Reporting* (ADM-DATA_REV).

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries onto Analytical Records* (ADM-DATANTRY).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the "before" and "after" integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration Policy* (CE-QA002).

21.2 Confirmation Analysis

21.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed as required by the method, typically by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This is limited to petroleum hydrocarbon analyses (e.g., gasoline and diesel) and does not include polychlorinated biphenyls.
- The sample meets all of the following requirements:

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1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.
2. All analytes have been previously analyzed in sample(s) from the same source, identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

21.2.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC, LC or GC/MS methods are summarized below:

- GC and LC Methods
  1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).
  2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.
- GC/MS Methods - Two criteria are used to verify identification:
  1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.
  2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

21.3 Data Review and Validation of Results

The integrity of the data generated is assessed through the evaluation of the sample results, calibrations, and QC samples (method blanks, laboratory control samples, sample duplicates, matrix spikes, trip blanks, etc.). A brief description of the evaluation of these analyses is described below, with details listed in applicable SOPs. The criteria for evaluation of QC samples are listed within each method-specific SOP. Other data evaluation measures may include (as necessary) a check of the accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

Note: Within the scope of this document, all possible data assessment requirements for various project protocols cannot be included in the listing below. This listing gives a general description of data evaluation practices used in the laboratory in compliance with NELAP Quality Systems requirements. Additional requirements exist for certain programs, such as projects under the DoD QSM protocols, and project-specific QAPPs.

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- Method Calibration – Following the analysis of calibration blanks and standards according to the applicable SOP the calibration correlation coefficient, average response factor, etc. is calculated and compared to specified criteria. If the calibration meets criteria analysis may continue. If the calibration fails, any problems are isolated and corrected and the calibration standards reanalyzed. Following calibration and analysis of the independent calibration verification standard(s) the percent difference for the ICV is calculated. If the percent difference is within the specified limits the calibration is complete. If not, the problem associated with the calibration and/or ICV are isolated and corrected and verification and/or calibration is repeated.
- Continuing Calibration Verification (CCV) – Following the analysis of the CCV standard the percent difference is calculated and compared to specified criteria. If the CCV meets the criteria analysis may continue. If the CCV fails, routine corrective action is performed and documented and a 2nd CCV is analyzed. If this CCV meets criteria, analysis may continue, including any reanalysis of samples that were associated with a failing CCV. If the routine corrective action failed to produce an immediate CCV within criteria, then either acceptable performance is demonstrated (after additional corrective action) with two consecutive calibration verifications or a new initial calibration is performed.
- Method Blank – Results for the method blank are calculated as performed for samples. If results are less than the MRL (<½ MRL for DoD projects), the blank may be reported. If not, associated sample results are evaluated to determine the impact of the blank result. If possible, the source of the contamination is determined. If the contamination has affected sample results the blank and samples are reanalyzed. If positive blank results are reported, the blank (and sample) results are flagged with an appropriate flag, qualifier, or footnote.
- Sample Results (Inorganic) – Following sample analysis and calculations (including any dilutions made due to the sample matrix) the result is verified to fall within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. When sample and sample duplicates are analyzed for precision, the calculated RPD is compared to the specified limits.

  The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis. Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly.
- Sample Results (Organic) – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. Results outside of the calibration range are diluted to within the calibration range. When dilutions are performed the MRL is elevated accordingly.
- Surrogate Results (Organic) – The percent recovery of each surrogate is compared to specified control limits. If recoveries are acceptable, the results are reported. If recoveries do not fall within control limits, the sample matrix is evaluated. When matrix interferences are present or documented, the results are reported with a qualifier that matrix interferences are present.

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If no matrix interferences are present and there is no cause for the outlier, the sample is reanalyzed. However, if the recovery is above the upper control limit with non-detected target analytes, the sample may be reported. All surrogate recovery outliers are appropriately qualified on the report.

- Duplicate Sample and/or Duplicate Matrix Spike Results – The RPD is calculated and compared to the specified control limits. If the RPD is within the control limits the result is reported. If not, an evaluation of the sample is made to verify that a homogenous sample was used and the results are compared to the MRL. The samples and duplicates are reanalyzed and if re-analysis also produces out-of-control results, the results are reported with an appropriate qualifier.
- Laboratory Control Sample Results – Following analysis of the LCS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits, the analysis is in control and results may be reported. If not, this indicates that the analysis is not in control. Samples associated with the 'out of control' LCS, shall be considered suspect and the samples reanalyzed or the data reported with the appropriate qualifiers.
- Matrix Spike Results – Following analysis of the MS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits the results may be reported. If not, and the LCS is within control limits, this indicates that the matrix potentially biases analyte recovery. It is verified that the spike level is at least five times the background level. If not, the results are reported with a qualifier that the background level is too high for accurate recovery determination. If matrix interferences are present or results indicate a potential problem with sample preparation, steps may be taken to improve results; such as dilution and reanalysis, or re-preparation and reanalysis. Results that do not meet acceptance limits are reported with an appropriate qualifier.

21.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package will undergo a peer review by a trained chemist. Prior to release of the report to the client, the Project Manager reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw test data, along with a copy of the final report, is retained by service request number for archival purposes. ALS Environmental maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data is calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Review and Reporting* (ADM-DATA_REV) addresses the flagging and qualification of data. The ALS Environmental-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the analyst or project manager to explain problems with a specific analysis or sample, etc.

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For subcontracted analyses, the Project Manager verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Manager accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the ALS Environmental client.

21.5 Deliverables

In order to meet individual project needs, ALS Environmental provides several levels of analytical reports. Standard specifications for each level of deliverable are described in Table 21-1. Variations may be provided based on client or project specifications.

When requested, ALS Environmental provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. ALS Environmental is capable of generating EDDs with many different formats and specifications. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the final report for accuracy.

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Table 21-1
Descriptions of ALS Environmental Standard Data Deliverables

Tier I. Routine Certified Analytical Report includes the following:

1. Transmittal letter
2. Chain of custody documents and sample/cooler receipt documentation
3. Sample analytical results
4. Method blank results
5. Surrogate recovery results and acceptance criteria for applicable organic methods
6. Dates of sample preparation and analysis for all tests
7. Case narrative - optional

Tier II. In addition to the Tier I Deliverables, this includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Laboratory Control Sample result(s) with calculated recovery and including associated acceptance criteria
4. Case narrative - optional

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this includes the following:

1. Case narrative - required
2. Summary forms for all associated QC and Calibration parameters, with associated control criteria/acceptance limits

Note: Other summary forms specified in QAPPs or project/program protocols, or those related to specialized analyses such as HRGC/MS will be included.

Tier IV. Full Data Validation Package:

1. All raw data associated with the sample analysis, including but not limited to:
   a. Preparation and analysis bench sheets and instrument printouts,
   b. For organics analyses, all applicable chromatograms, spectral, confirmation, and manual integration raw data. For GC/MS this includes tuning results, mass spectra of all positive hits, and the results and spectra of TIC compounds when requested.
   c. QC data,
   d. Calibration data (initial, verification, continuing, etc),
   e. Calibration blanks or instrument blanks (as appropriate to method).
2. If a project QAPP or program protocol applies, the report will be presented as required by the QAPP.

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22) Summary of Changes and Document History

Revision Number	Effective Date	Document Editor	Description of Changes
27	01/11/14	C. Humphrey	Major document reformat revision. New cover page and footer. QA manual cross reference table added. Sections reorganized as outlined in ALS QA Manual template.

23) References for Quality System Standards, External Documents, Manuals, and Test Procedures

The analytical methods used at ALS Environmental generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Typical methods used at ALS Environmental are taken from the references listed below. Additional QA program documents are listed in Appendix I.

- National Environmental Laboratory Accreditation Program (NELAP), 2003 Quality Standards.
- 2009 TNI Standards.
- American National Standard *General requirements for the competence of testing and calibration laboratories,* ANSI/ISO/IEC 17025:2005(E)
- *DoD Quality Systems Manual for Environmental Laboratories,* Version 4.2, 10/25/2010.
- *DoD Quality Systems Manual for Environmental Laboratories,* Version 5.0, July 2013.
- American Industrial Hygiene Association-LAP, LLC Policy Document Modules (2A Revision 12, January 7, 2013; 2B Revision 11, June 18, 2013; 6 Revision 1, January 7, 2013), Appendix G (Revision 2, June 11, 2013), and Appendix H (Revision 1, June 11, 2013).
- 3M Organic Vapor Monitor Sampling and Analysis Guide, *Organic Vapor Monitors 3500/3510 and Organic Vapor Monitors 3520/3530*, Technical Bulletin 1028, January 1, 2004.
- 40 CFR Part 60, Test Methods for Standards of Performance for New Stationary Sources, Appendix A.
- 40 CFR Part 63, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, Appendix A.
- 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants for Source Categories, Subchapter C.
- 40 CFR Part 136, Definition and Procedure for the Determination of the Method Detection Limit, Appendix B
- American Society for Testing and Materials (ASTM), Gaseous Fuel, Coal and Coke, Volume 05.06, September 2006.
- American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Philadelphia, PA.

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- Arizona Administrative Code, *Department of Health Services – Laboratories*, Title 9, Ch. 14, Article 6. *Licensing of Environmental Laboratories*, R9-14-601 through R9-14-621, December 31, 2006 (Supp. 06-4)
- California Environmental Protection Agency Air Resources Board, *Methods for Determining Emissions of Toxic Air Contaminants from Stationary Sources*, Volume 3, July 28, 1997.
- California Code of Regulations (CCR), Title 22, Chapter 11 *Identification and Listing of Hazardous Waste*, 7/20/05.
- Minnesota Administrative Rules, *Department of Health*, Chapter 4740, Laboratories; Accreditation Requirements.
- *Good Automated Laboratory Practices, Principles and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185 (August 1995).
- Environmental Protection Agency, Methods Update Rule (MUR), Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures; 40 CFR Parts 122, 136, 143, 430, 455 & 465; Final Rule 3/12/07, Effective April 11, 2007.
- Environmental Protection Agency, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, Third Edition, 1986 and Updates I (7/92), II (9/94), III (12/96), IIIA (4/98), IIIB (11/04), IVA & IVB. See Chapters 1, 2, 3, 4, 5, 6, and 8.
- Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, 1983.
- Environmental Protection Agency, *Methods for the Determination of Inorganic Substances in Environmental Samples,* EPA 600/R-93-100, August 1993.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition, EPA/625/R-96-010b, January 1999.
- Environmental Protection Agency, *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition Addendum, October 4, 2000.
- National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*, Third Edition (August 1987); Fourth Edition (August 1994); 1st Supplement Publication 96-135, 2nd Supplement Publication 98-119, 3rd Supplement 2003-154
- National Council for Air and Stream Improvement, Inc. (NCASI). 2007. *Appendix E - Technical Bulletin Cross Reference Guide for NCASI Methods.* Methods Manual (05).
- *SKC 575 Series Passive Sampler Rate/Selection Guide,* Form #37021, Rev 0012.
- *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (1998).
- South Coast Air Quality Management District, *Laboratory Methods of Analysis for Enforcement Samples.*
- U.S. Department of Labor, Occupational Safety and Health Administration *OSHA Analytical Methods Manual.*

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APPENDIX A – Glossary

Acronym	Definition
AB	Accrediting Body
ACS	American Chemical Society
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
BFB	4-Bromofluorobenzene
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service Registry Number
CCB	Continuing Calibration Blank sample
CCC	Continuing Calibration Check sample
CCV	Continuing Calibration Verification sample
CDC	Ongoing Demonstration of Capability
CLP	Contract Laboratory Program (through USEPA)
COC	Chain-of-Custody
DCM	Dichloromethane (aka Methylene Chloride)
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOC	Demonstration of Capability
DOE	Department of Ecology (state or federal)
DOH	Department of Health
EPA	U.S. Environmental Protection Agency (aka USEPA)
EPCRA	Emergency Planning & Community Right-to-Know Act
ERA	Environmental Resource Associates
ELAP	Environmental Laboratory Accreditation Program
FID	Flame Ionization Detector
FIFRA	Federal Insecticide, Fungicide & Rodenticide Act
FR	Federal Register
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
HP	Hewlett-Packard (mfg. GC instruments)

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HPLC	High Performance Liquid Chromatography
IC	Ion Chromatography
ICAL	Initial Calibration
ICB	Initial Calibration Blank sample
IDC	Initial Demonstration of Capability
ICV	Initial Calibration Verification sample
IFB	Invitation for Bid
ISO/IEC	International Organization for Standardization/International Electrochemical Commission
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LUFT	Leaking Underground Fuel Tank
MB	Method Blank
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NAS	National Academy of Sciences
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NCASI	National Council for Air and Stream Improvement (for the Paper Industry)
NCI	National Cancer Institute
ND	Not Detected
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPD	Nitrogen Phosphorus Detector
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
NTIS	National Technical Information System
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PE	Performance Evaluation sample

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PID	Photoionization Detector
PQL	Practical Quantitation Limit
PT	Proficiency Test
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
RAS	Routine Analytical Services (Contracts through USEPA)
RCRA	Resource Conservation and Recovery Act
RFP	Requests for Proposal
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAS	Special Analytical Services (contracts through USEPA)
SIE	Selective Ion Electrode
SIM	Selected Ion Monitoring
SMO	Sample Management Office (aka Sample Receiving)
SOC	Semi-Volatile Organic Compounds
SOP	Standard Operating Procedure
SOQ	Statement of Qualifications
SOW	Statement of Work
SVOAs	Semi-Volatile Organic Analytes
SVOCs	Semi-Volatile Organic Compounds
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
TNI	The NELAC Institute
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
UST	Underground Storage Tank
UV	Ultraviolet Spectrophotometer
VOA	Volatile Organic Analyte
VOC	Volatile Organic Compounds
WP	Water Pollution
WS	Water Supply

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Units	Definition
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
mg/m3	Milligrams per Cubic Meter
ng/L	Nanograms per Liter
ppb	Parts Per Billion
ppbV	Parts Per Billion Volume
ppm	Parts Per Million
ppmV	Parts Per Million Volume
ug/L	Micrograms per Liter
ug/m3	Micrograms per Cubic Meter

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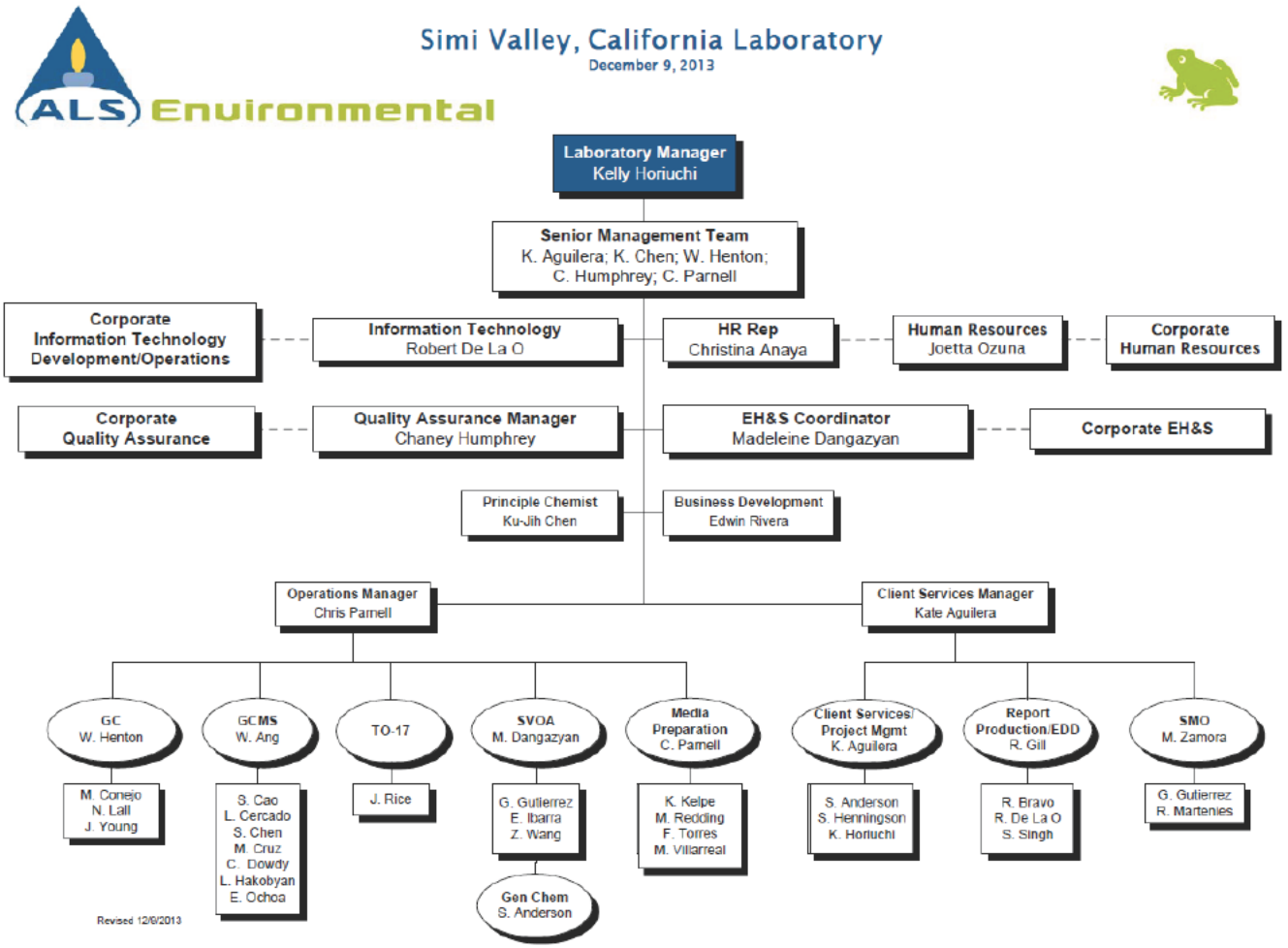
APPENDIX B – Organization Charts and Key Personnel Qualifications



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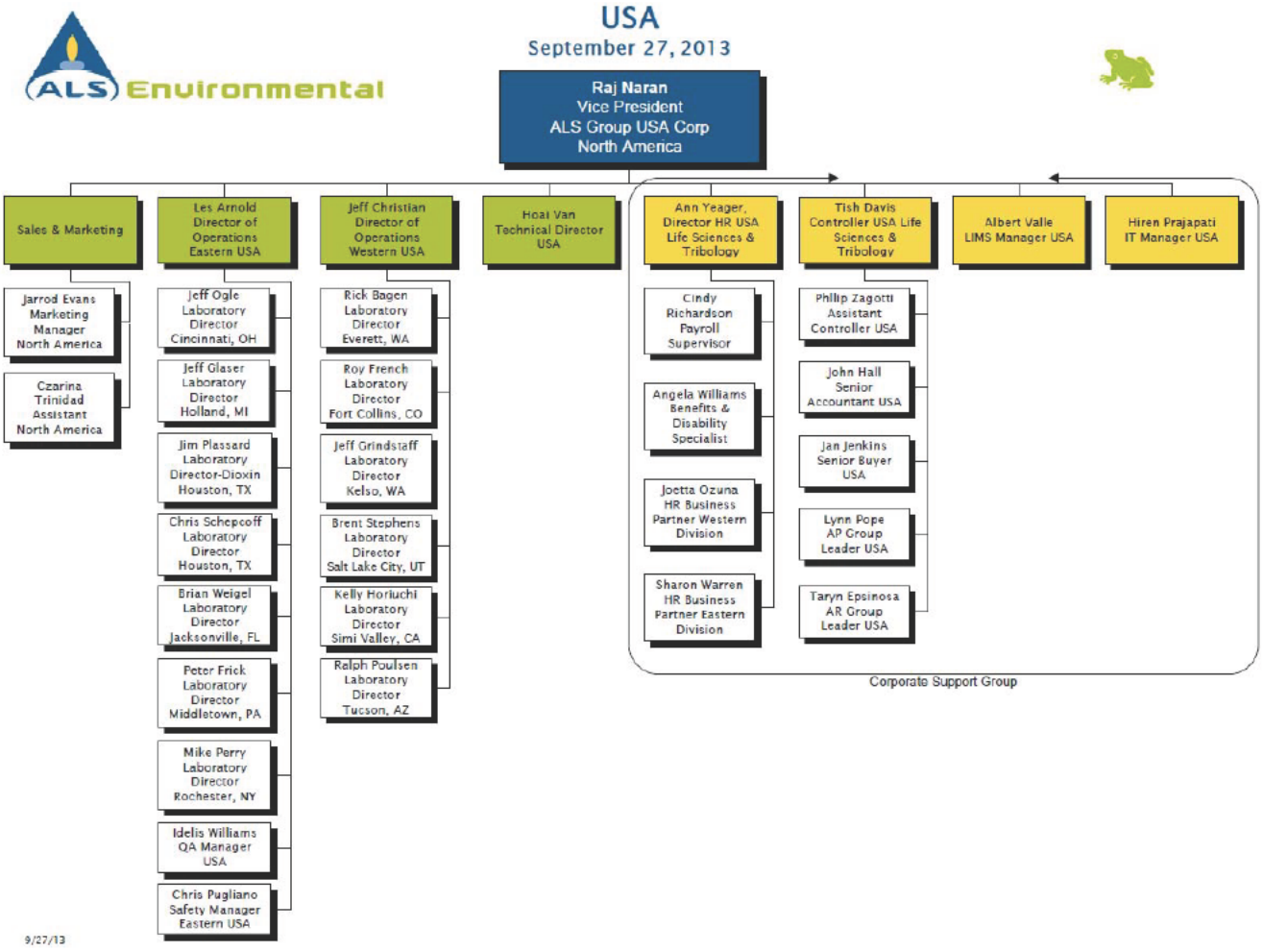

Non-Controlled

Kathleen 'Kate' Aguilera

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ALS Environmental

Education

California State University - Northridge, CA
BA, Chemistry, 1989

Affiliations

American Chemical Society

Client Services Manager / Project Manager

1997 – Present

Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs.

Previous Experience

Columbia Analytical Services, Inc. — **Project Manager, '97 – '11**
Simi Valley, CA

Responsibilities: Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the client's needs.

Columbia Analytical Services, Inc. — **GC/MS Analytical Chemist, '94 – '97**
(DBA Performance Analytical, Inc.)
Los Angeles, CA

Responsibilities: Analysis of air samples using EPA compendium methods TO-1, TO-2 and TO-14 using cryogenic concentration and thermal desorption techniques on whole air samples collected in summa canisters, Tedlar bags, and solid sorbent air samples. Proficient in the interpretation of mass spectra. Responsible for the preparation and quality control verification of solid sorbent sampling media for EPA Compendium methods TO-1 and TO-2.

Performance Analytical, Inc. — **GC/MS Analytical Chemist, '92 – '94**
Canoga Park, CA

Responsibilities: Analysis of air samples using EPA compendium methods TO-1, TO-2 and TO-14 using cryogenic concentration and thermal desorption techniques on whole air samples collected in summa canisters, Tedlar bags, and solid sorbent air samples. Proficient in the interpretation of mass spectra. Responsible for the preparation and quality control verification of solid sorbent sampling media for EPA Compendium methods TO-1 and TO-2.

Performance Analytical, Inc. — **GC Analytical Chemist, '89 – '92**
Canoga Park, CA

Responsibilities: Performed analyses of air samples for reduced sulfur compounds, hydrocarbon distribution and speciation, fixed atmospheric gases and total gaseous non-Methane organics. Performed analyses of soil and water samples for TPHg (mod. 8015) and BTEX. Performed extractions and analyses of CARB, NIOSH, OSHA and EPA 8000 series methods. Also performed metals analysis using flame and graphite furnace atomic absorption spectrophotometry (AA, GFAA).

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Susan 'Sue' Anderson

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ALS Environmental

Education

University of Illinois - Urbana-Champaign, IL
BS, Biochemistry, 1989

Project Manager/Technical Manager (General Chemistry)

2011 – Present

Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the clients' needs. Also responsible for the training of general chemistry staff, maintenance of MDL studies, and standard operating procedures, data evaluation and report responsibility.

Previous Experience

Columbia Analytical Services, Inc. — **Project Manager/Technical Manager (General Chemistry), '06 – '11**
Simi Valley, CA

Responsibilities: Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinates with the laboratory and administration to ensure that analyses are properly executed and meets the client's needs. Also responsible for the training of general chemistry staff, maintenance of MDL studies, and standard operating procedures, data evaluation and report responsibility.

Columbia Analytical Services, Inc. — **Project Manager/Technical Manager (General Chemistry), '02 – '06**
Canoga Park, CA

Responsibilities: In addition to the Project Manager duties listed below, also responsible for the management of General Chemistry laboratory operations, including the financial aspects. This includes supervision and coordination of work load and training personnel as necessary as well as supervision of method development and certification, maintenance of MDL studies and SOPs, data evaluation and report responsibility. Other duties include participation in the formulation of project strategy and meetings involving major technical issues, working with regional senior management in short and long-range planning, and other duties as assigned.

Columbia Analytical Services, Inc. — **Project Manager II, '00 – '02**
Canoga Park, CA

Responsibilities: Responsibilities include interfacing with clients to provide technical project management and customer service, including project scheduling and tracking from the delivery of sample bottles to client site to the delivery of the completed analytical report. Ensures that the client receives timely, appropriate, and quality analytical services. Coordinates with the CAS laboratory and administration to ensure that analyses are properly executed and meet the clients' needs. Coordinates sub-contracting with internal and external laboratories. Acts as a liaison for all client-related activities within Columbia Analytical Services, Inc. Interfaces with work processing staff to answer technical questions that arise during EDD completion. Has high level role in data evaluation and report responsibility. High level client and regulatory agency contact.

Columbia Analytical Services, Inc. — **Scientist I-III, '92 – '00**
Canoga Park, CA

Responsibilities: Responsible for performing inorganic analyses such as: alkalinity, ammonia, BOD, COD, cyanide, sulfide, reactivity, fluoride, pH, hardness, hexavalent chromium, phenols, surfactants, total-dissolved-suspended solid, conductivity, turbidity, nitrate, chloride by titration, turbidimetric sulfate, color, odor, organic lead, residual chlorine, settleable solids, specific gravity, carbon dioxide, TCLP/STLC metals and semi-volatile extraction. Also perform analyses for TRPH and oil and grease and occasionally perform metals digestion. Also ran the Graphite furnace for all furnace metals and was responsible for standard prep and maintenance.

National Environmental Testing — **Wet Chemistry, '90 – '91**
Bartlett, IL

Responsibilities: Responsible for the analyses for wastewater parameters and some inorganic analytes.

Non-Controlled

Widayati 'Wida' Ang

2655 Park Center Drive, Suite A | Simi Valley, CA 93065 | +1 805 526 7161

ALS Environmental

Education

Technical University of West Berlin -
West Berlin, Germany
BS, Chemistry 1982

Technical University of West Berlin -
West Berlin, Germany
MS, Chemistry 1984

Volatile GC/MS Team Leader

2011 – Present

Team leader for the Volatile Gas Chromatography Mass Spectrometry Air group responsibilities are but are not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of her direct reports.

Previous Experience

Columbia Analytical Services, Inc. — **Volatile GC/MS Team Leader, '08 – '11**
Simi Valley, CA
Duties as above.

Columbia Analytical Services, Inc. — **GC/MS Chemist, '07 – '08**
Simi Valley, CA
Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Columbia Analytical Services, Inc. — **Technical Manager, Organic Chemistry, '99 – '07**
Canoga Park, CA
Responsible for managing the organics department with regards to State and Federal regulatory requirements. Supervises and coordinates work load and trained personnel. Supervised method development and certification, as well as method troubleshooting and instrument maintenance. Responsible for mobile laboratory operations.

Laboratory Data Consultants, Inc. — **Data Validator, '98 – '99**
Carlsbad, CA
Responsible for retrieving analytical data from closed down laboratory operations, review and validation of data packages. Supervised other employees for data package assembly

VOC Laboratories, Inc. — **Assistant QC Manager and Data Package Specialist, '96 – '98**
Glendale, CA
Responsible for overseeing data quality of final data validation packages. Managed production of data packages to meet various State and Federal analytical programs as well as customized client formats. Oversaw enforcement of the laboratory for implementation of corrective action measure. Interacted with chemists and project managers to ensure accuracy and completeness of data deliverables.

Thermo Analytical — **Technical Director/Department Manager, '92 – '96; Department Supervisor and Chemist, '88 - '92**
Monrovia, CA
Responsible for daily operations of the organic chemistry department. Developed standard operating procedures for various methods. Reviewed analytical data generated for completeness and contractual requirements according to Contract Laboratory Program (CLP) and SW-846 methods. Organized and scheduled reports for project managers. Responsible for upgrading and purchasing new instrumentation. Provided technical support to QC coordinator and laboratory personnel. Assisted with proposal preparation and audits. Responsible for training chemists and technicians in proper performance of various analytical methods. Responsible for sample analysis of water, soil, and air for volatile organics by GC and GC/MS. Assisted chemists in the analysis and interpretation of pesticides and PCBs.

Shankman Laboratories — **Analytical Chemist, '86-'88**
Los Angeles, CA
Prepared and analyzed soil and water samples using GC, GC/MS, HPLC, IR, IC and UV spectrophotometic techniques

Non-Controlled

Ku-Jih Chen

2655 Park Center Drive, Suite A | Simi Valley, CA 93065 | +1 805 526 7161

ALS Environmental

Education

National Chung-Hsing University - Taipei, Taiwan
BS, Botany, 1975

Principle Chemist

2011 – Present

Responsible for the development and validation of sampling and analysis methods, new technology and laboratory automation.

Previous Experience

Columbia Analytical Services, Inc. — **Principle Chemist, '00 - '11**
Simi Valley, CA
Responsibilities: Responsibilities listed above.

Columbia Analytical Services, Inc. — **Scientist VII, '94 - '00**
(dba Performance Analytical, Inc.)
Los Angeles, CA
Responsibilities: Responsibilities included operating the gas chromatography and sample preparation laboratories, developing methods (previously developed the Total Combustion Analyzer for the measurement of reactive organic gases in stationary source samples, and the Determination of Reduced Sulfur Compounds and fixed atmospheric gases in POTW emissions, refinery and landfill gases), and serving as the laboratory's primary Industrial Hygiene Chemist.

Performance Analytical, Inc. — **Principle Chemist, '89-'94**
Canoga Park, CA
Responsibilities: Responsibilities listed above.

C-E Environmental, Inc. — **Extraction Laboratory Supervisor, '84 – '89**
Camarillo, CA
Responsibilities: Responsibilities included supervising chemists, associate chemists, and technicians, preparing SOPs, analytical standards, and spiking solutions, serving as Primary Extraction Chemist for the Love Canal Habitability Study, and previously responsible for instrumental analysis using GC, LC, GC/MS, and AA.

Paolyta Company — **Research and Development Chemist, '80 – '84**
Taipei, Taiwan

Panlabs Taiwan Ltd. — **Research Chemist, '75 – '80**
Taipei, Taiwan

Non-Controlled

Madeleine Dangazyan

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ALS Environmental

Education

California State University at Northridge - Northridge, CA
BS, Chemistry 1995

Semi-Volatiles Technical Manager and EH&S Manager

2011 – Present

As EH&S Manager, is responsible for the implementation of the Environmental Health and Safety program of ALS North America to this facility. Duties include accident investigation and incident review, maintenance of all safety-related equipment and documents, and performing safety audits and reporting results to management. Semi-Volatiles/Industrial Hygiene Technical Manager responsibilities are but not limited to training of junior chemists, data reduction and peer review of analytical data, mentoring of junior analysts, writing and reviewing of standard operating procedures. Development and implementation of new methods. Duties also require performance reviews and development of direct reports. Additional responsibilities are analyzing ambient air, source emissions, and industrial hygiene samples using GC and HPLC utilizing OSHA, NIOSH and EPA mandated methodologies. Preparation and analysis of air samples taken on various sorbent tubes for semi-volatile organic compounds. Determination of Carbonyls, Phenols and Cresols in ambient air and source emission samples using HPLC. Determination of Polynuclear Aromatic Hydrocarbons using EPA Method TO-13A. Analysis of Pesticides and PCBs using EPA Methods TO-4A and TO-10A. Routine and necessary instrument maintenance.

Previous Experience

Columbia Analytical Services, Inc. — **Semi-Volatiles Technical Manager, '02- '11; EH&S Manager '10-11**
Simi Valley, CA

Responsibilities: Responsibilities listed above.

Columbia Analytical Services, Inc. — **Scientist, '00- '02**
Simi Valley, CA

Responsibilities: Responsibilities include training of chemists, peer review of analytical data, mentoring or junior analyst, standard operating procedure review, and streamlining of methods. Additional responsibilities are analyzing ambient air, source emissions, and industrial hygiene samples using GC and HPLC utilizing OSHA, NIOSH and EPA mandated methodologies. Preparation and analysis of air samples taken on various sorbent tubes for semi-volatile organic compounds. Determination of Carbonyls, Phenols and Cresols in Aromatic Hydrocarbons using EPA Method TO-13A. Analysis of Pesticides and PCBs using EPA Methods TO-4A and TO-10A. Routine and necessary instrument maintenance.

Columbia Analytical Services, Inc. — **Scientist, '99- '00**
(dba Performance Analytical, Inc.)
Simi Valley, CA

Responsibilities: Responsibilities include analyzing indoor and ambient air, source emission, and industrial hygiene samples by GC methods.

Air Products and Chemicals, Inc. — **Analytical Chemist, '95 – '99**
Long Beach, CA

Responsibilities: Quality assurance analysis of EPA protocol gases utilizing GC, FTIR and NDIR. Preparation of personnel schedules, lead laboratory contact.

California State University at Northridge — **Undergraduate Researcher, '93 – 94**
Northridge, CA

Responsibilities: Assisted professor with improving and implementing student laboratory experiments to better utilize a GC/MS.

Non-Controlled

Wade Henton

2655 Park Center Drive, Suite A | Simi Valley, CA 93065 | +1 805 526 7161

ALS Environmental

Education

University of California at Santa Barbara – Santa Barbara, CA
BS, Chemistry 1985

Volatile GC Team Leader

2011 – Present

Team leader for the Volatile Gas Chromatography department where responsibilities include but are not limited to training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review, and streamlining of methods. Duties also require performance reviews and development of direct reports.

Previous Experience

Columbia Analytical Services, Inc. — **Volatile GC Team Leader, '00 – '11**
Simi Valley, CA
Responsibilities listed above.

Columbia Analytical Services, Inc. — **Scientist V, '95 – '00**
(dba Performance Analytical, Inc.)
Los Angeles, CA
Responsibilities include analyzing indoor and ambient air, source emission, and industrial hygiene samples by GC and GC/MS methods.

Columbia Analytical Services, Inc. — **Scientist IV, '94 – '95**
(dba Performance Analytical, Inc.)
Los Angeles, CA
Responsibilities listed above.

Coast-to-Coast Analytical Services — **Analytical Chemist, '92 – '94**
Camarillo, CA
Responsibilities included analyzing samples using EPA methods 625, 525 and 1625 as well as developing new methods for GC/MS testing.

Coast-to-Coast Analytical Services — **Analytical Chemist, '91 – '92**
Goleta, CA
Responsibilities included analyzing samples using EPA methods 624 and 524.2 by GC/MS. Used GC/MS methods to perform fuel fingerprinting

Combustion Engineering Environmental — **Analytical Chemist, '86 – '91**
Camarillo, CA
Responsibilities included method development for GC and HPLC. Analysis of samples using EPA methods 608, 615, 631, 632 and SW846. Other methods used include 8080, 8010, 8020, 8150 and 8030. Oversaw data integrity for the GC Laboratory instrument data network. Data review.

Fortin Industries — **Chemist, '86**
Sylmar, CA
Research and Development and Quality Assurance/Quality Control on polymer products and metal coatings using differential scanning calorimeters, scanning electron microscope, AA, GC, and HPLC.

Non-Controlled

Kelly M. Horiuchi

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ALS Environmental

Education

California State University, Northridge,CA
BA, Biology, 1998

Laboratory Director

2011 - Present

Primary responsibilities include management of all laboratory departments, scheduling, productivity, reporting and evaluation of analytical methodologies, project planning, budgeting, and Quality Assurance/Quality Control protocol oversight. Other responsibilities include conducting facility compliance reviews; providing departmental support for equipment purchases; resolving personnel issues; determining resource allocation; and providing supervision, training, and leadership to key laboratory staff. In addition, other responsibilities include direct responsibility for national contracts and consultants.

Previous Experience

Columbia Analytical Services, Inc.
Simi Valley, CA
Laboratory Director, '09-'11

Responsible for all phases of laboratory operations, including project planning, budgeting, and quality assurance.

Columbia Analytical Services, Inc.
Simi Valley, CA
Project Manager, '05-'09

Responsibilities: Interfacing with clients to provide technical project management and customer service, including project scheduling, tracking and consulting to determine appropriate sampling and analytical protocols. Coordinated with the laboratory and administration to ensure that analyses were properly executed and meets the client's needs.

Columbia Analytical Services, Inc.
Simi Valley, CA
Data Validation Coordinator,'03-'05

Responsibilities: Validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Compiled quality control summary, and calibration data upon client request for data packages. Assist the Quality Assurance Program Manager with standard operating procedures, control charting, and audit preparation.

Cure Autism Now
Los Angeles, CA
Database Analyst, '02-'03

Responsibilities: Performed analysis of test date through data audits and queries, maintained extensive database, and coordinated data audits between Northern and Southern California locations. Additional duties included assisting in the creation of new databases, as needed, creation of SOP for phenotypic and genotypic data collecting, and process improvements for subject flow through the research project.

Columbia Analytical Services, Inc.
(dba Performance Analytical, Inc.)
Simi Valley, CA
Scientist II, Data Validation Coordinator, '00-'02

Responsibilities: Validation of all analytical results produced by the laboratory. Verification of client analyses, sample information, and reporting format. Compiled quality control summary, and calibration data upon client request for data packages. Assisted the Quality Assurance Program Manager with standard operating procedures, control charting, and audit preparation.

Specialty Laboratories
Santa Monica, CA
Administrative Assistant, Data Analyst, '99-'00

Responsibilities: Performed retrieval, quality control, and organization of data. Compiled data for reporting of HIV, lead, urinalysis, kidney stones, and communicable diseases. Also communicated with the state DOH and clients regarding reporting requirements and demographic information.

Non-Controlled

Chaney Humphrey

2655 Park Center Drive, Suite A • Simi Valley, CA 93065 • +1 805 526 7161

ALS Environmental

Education

Oregon State University,
Corvallis, OR
BS, Biology, 2004

Quality Assurance Manager

2011 - Present

Responsibilities include facilitate ethics and QA training, maintain all training documentation, perform QA orientation for new employees, review data (both hardcopy and electronic), perform internal QA audits and prepare written reports, review, approve, and control Standard Operating Procedures, maintain QA Manual, maintain QA records (including archived logbooks, archived certificates of analysis, nonconformity and corrective action reports, MDL studies results, SOP revision and distribution, statistical control limits, PE sample results), serve as document control officer, and PC for all PE sample analyses, prepare corrective action report for any unacceptable PE sample results, maintain laboratory's certifications and approvals, facilitator for external QA audits and prepare written response to deficiencies, prepare activity report to management.

Previous Experience

Columbia Analytical Services, Inc. — **Quality Assurance Manager, -09 -11**
Simi Valley, CA

Duties same as above.

Columbia Analytical Services, Inc. — **Data Validation Coordinator, '07-'09**
Simi Valley, CA

Responsibilities include validation of analytical results produced by the laboratory. Verification of client analytical requests, sample information, and reporting formats. Interacts with project managers and Quality Assurance Program Manager to ensure that all reports fulfill client requirements as well as QA/QC needs. Compiled quality control summary, and calibration data upon client request for data packages.

Columbia Analytical Services, Inc. — **GC/MS Chemist,'05-'07**
Simi Valley, CA

Responsibilities: Analyzing indoor air, ambient air and source emission samples by GC/MS methods, standard preparation, perform maintenance on instruments when required, real time data reduction, participate in peer review process, and good practice of all QA/QC requirements.

Columbia Analytical Services, Inc. — **Analyst, '04-'05**
Kelso, WA

Responsibilities: Performed a variety of analytical tests within the General Chemistry laboratory according to EPA Methodologies including Ion Chromatography, total sulfur, and solids. Saturday crew member responsible for performance of all short hold time methods including microbiology methodologies.

Columbia Analytical Services, Inc. — **Temporary Employee, Summers '02-'04**
Kelso, WA

Responsibilities: Temporary employee (summers) performing a variety of analytical tests including grain size, total organic carbon, total suspended solids, total dissolved solids, alkalinity, acidity, and chemical oxygen demand. Additionally, performed colorimetric methods including ortho-phosphorous, total-phosphorous, hexavalent chromium, and nitrite as nitrogen.

Non-Controlled

Christopher Parnell

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ALS Environmental

Education

University of California
at Santa Barbara
Santa Barbara, CA
BS, Chemistry 1986

Operations Manager/Technical Advisor (Volatile GC/MS Air)

2012 – Present

Operation Managers responsibilities include planning, directing, and coordinating the operations of the laboratory departments. Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources. Reviews performance data to measure productivity and goal achievement and to determine areas needing cost reduction and program improvement to increase efficiency.

Technical Advisor for the Volatile Gas Chromatography Mass Spectrometry department. Has the responsibility of oversight of training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review and streamlining of methods. Duties also require performance reviews and development of direct reports.

Previous Experience

ALS Environmental
Simi Valley, CA
Technical Advisor (Volatile GC/MS Air), '11 – '12
Responsibilities: Technical Advisor responsibilities listed above.

Columbia Analytical Services, Inc.
Simi Valley, CA
Technical Advisor (Volatile GC/MS Air, '08 – '11
Responsibilities: Technical Advisor responsibilities listed above.

Columbia Analytical Services, Inc.
Simi Valley, CA
GC/MS Team Leader, '00 – '08
Responsibilities: Team leader for the Volatile Gas Chromatography Mass Spectrometry group. Responsibilities include training of chemists, peer review of analytical data, mentoring of junior analysts, standard operating procedure review, and streamlining of methods. Duties also require performance reviews and development of direct reports.

Columbia Analytical Services, Inc.
(dba Performance Analytical, Inc.)
Los Angeles, CA
Scientist VI, '94 – '00
Responsibilities: Responsibilities include analyzing indoor air, ambient air and source emission samples by GC/MS methods, standards preparation, perform maintenance on instruments when required, real time data reduction, participation in peer review process, and good practice of all QA/QC requirements.

Performance Analytical, Inc.
Canoga Park, CA
Scientist VI, '91 – '94
Responsibilities: Responsibilities listed above.

ABB Environmental Inc.
Camarillo, CA
Air Toxics Laboratory Supervisor, '90 – '91
Responsibilities: Responsibilities included scheduling client analyses and developing methods for non-routine analyses, and operating the Air Toxics laboratory.

C-E Environmental Inc., EMSI
Camarillo, CA
Analytical Chemist, '87 – '90
Responsibilities: Responsibilities included overseeing the Pesticide/PCB analysis of samples under the EPA Contract Laboratory Program, and interfacing with the EPA and regional offices to respond to inquiries, and performing GC analyses and extractions.

Damon Reference Laboratory
Newbury Park, CA
Chemist, '86 – '87
Responsibilities: Responsibilities included performing Enzyme-linked immunosorbent assays, Western-Blot assays, and Protein Electrophoresis.

Non-Controlled

APPENDIX C – Ethics and Data Integrity Policy

ETHICS AND DATA INTEGRITY AGREEMENT

I state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at ALS.

I agree that in the performance of my duties at ALS:

1. I shall not intentionally report data values that are not the actual values obtained;
2. I shall not intentionally report the dates, times and method citations of data analyses that are not the actual dates, times and method citations of analyses;
3. I shall not intentionally represent another individual's work as my own;
4. I shall not intentionally report data values that do not meet established quality control criteria as set forth in the Method and/or Standard Operating Procedures, or as defined by company policy.
5. I agree to inform ALS of any accidental or intentional reporting of non-authentic data by other employees.
6. I have read this ethics and data integrity agreement and understand that failure to comply with the conditions stated above will result in disciplinary action, up to and including termination.
7. I agree to adhere to the following protocols and principals of ethical conduct in my work at ALS. All work assigned to me will be performed using ALS approved methods and procedures and in compliance with the quality assurance protocols defined in the ALS Quality System.
8. I will not intentionally falsify nor improperly manipulate any sample or QC data in any manner. Furthermore, I will not modify data values unless the modification can be technically justified through a measurable analytical process or method acceptable to ALS. All such modifications and their justification will be clearly and thoroughly documented in the raw data and appropriate laboratory record, and will include my initials or signature and the date.
9. I will not make false statements to, or seek to otherwise deceive ALS staff, managers or clients. I will not knowingly, through acts of commission, omission, erasure or destruction, improperly report any test results or conclusions, be they for client samples, QC samples, or standards.
10. I will not condone any accidental or intentional reporting of unauthentic data by other ALS staff and will immediately report such occurrences to my Supervisor, Lab Director, Quality Assurance Manager, or Human Resources. I understand that failure to report such occurrences may subject me to immediate discipline, including termination.
11. If a supervisor, manager, director or other member of the ALS leadership group requests me to engage in or perform an activity that I feel is compromising data validity or defensibility, I have the right to not comply with the request. I also have the right to appeal this action through an ALS local Quality Staff, Corporate Quality Assurance or Human Resources.
12. I understand that if my job includes supervisory responsibilities, I will not instruct, request or direct any subordinate to perform any unethical or non-defensible laboratory practice. Nor will I discourage, intimidate or inhibit a staff member who may choose to appropriately appeal my supervisory instruction, request or directive that may be perceived to be improper, nor retaliate against those who do so.
13. I understand that employees who report violations of this policy will be kept free from intimidation and recrimination arising from such reporting.

I have read, and understand the above policy and realize that failure to adhere to it may result in disciplinary action, up to and including termination. Compliance with this policy will be strictly enforced with all personnel employed by the company.

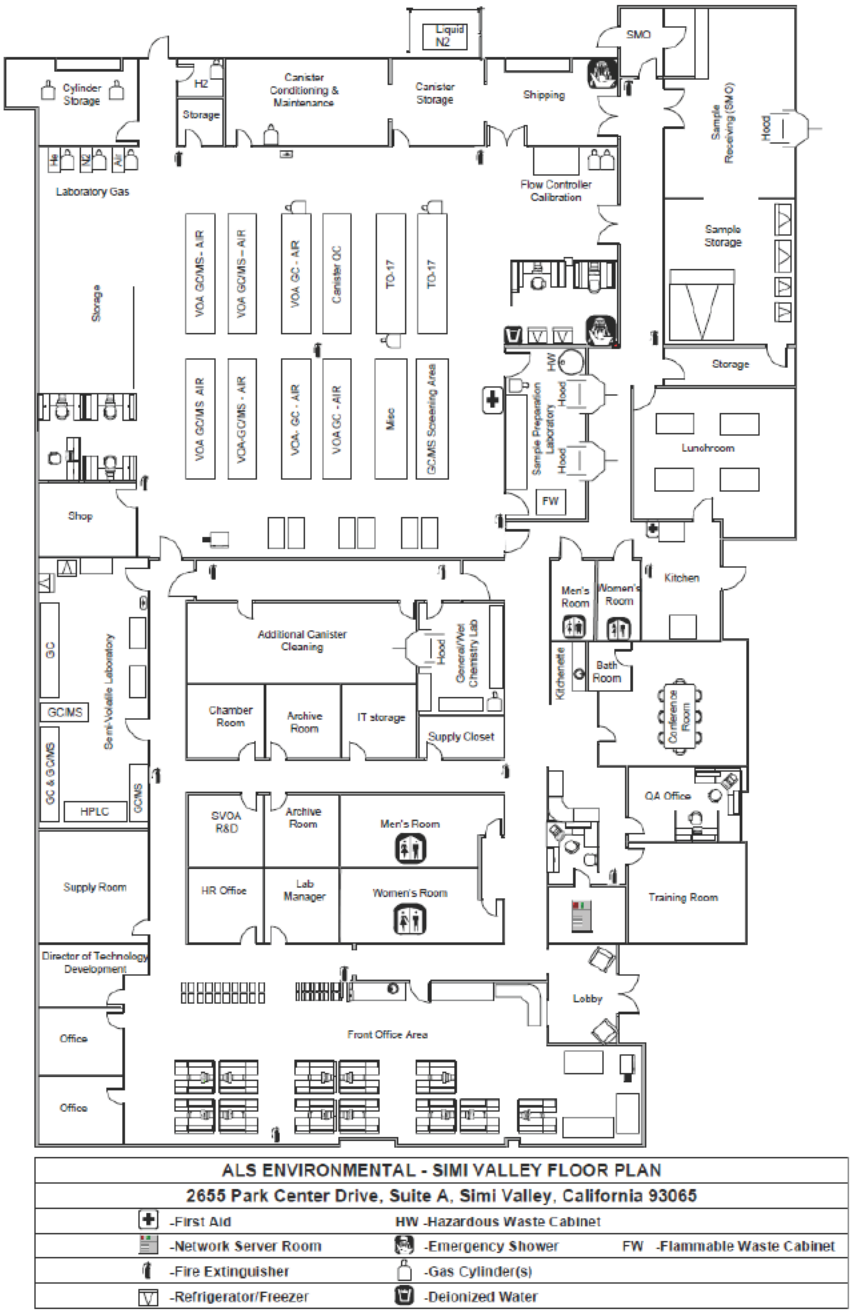
Employee Name _____ Signature _____

ALS Location_____ Date _____

Non-Controlled

APPENDIX D – Laboratory Floor Plan

ALS Environmental-Simi Valley Laboratory Floor Plan



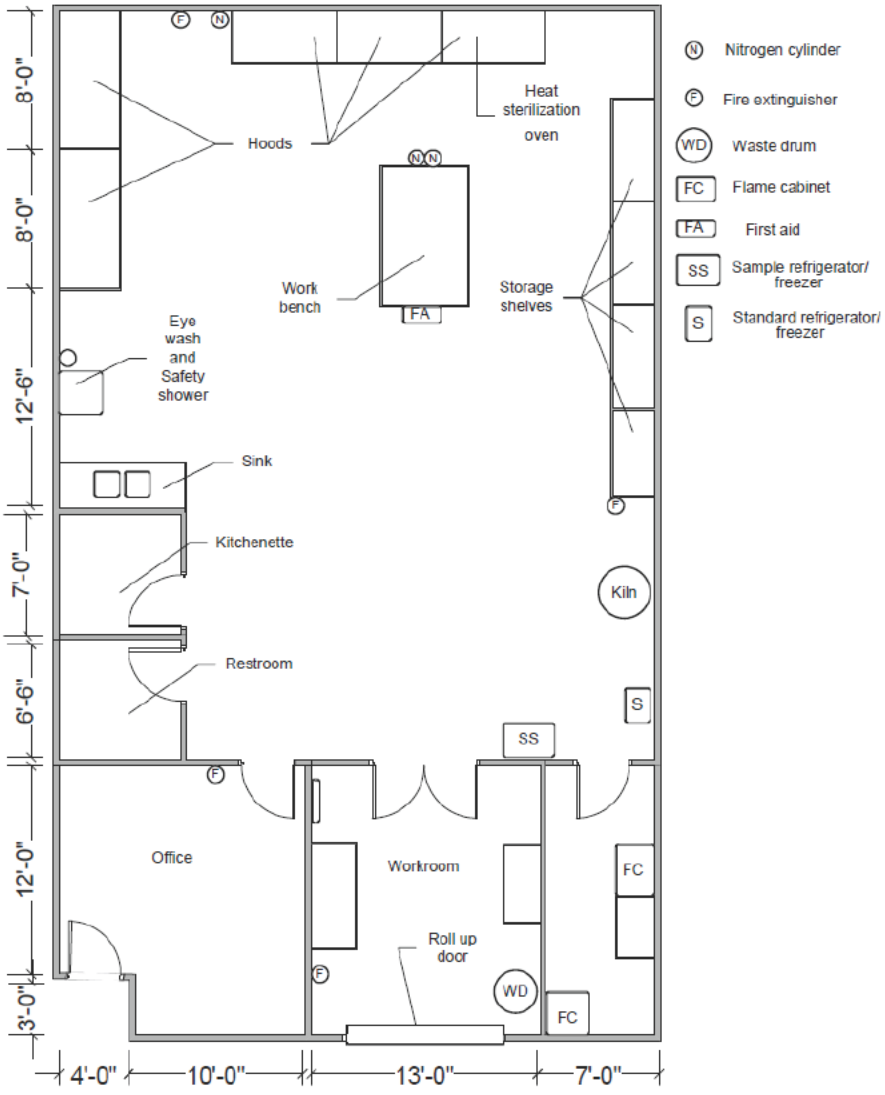
ALS ENVIRONMENTAL - SIMI VALLEY FLOOR PLAN		
2655 Park Center Drive, Suite A, Simi Valley, California 93065		
-First Aid	HW -Hazardous Waste Cabinet	
-Network Server Room	-Emergency Shower	FW -Flammable Waste Cabinet
-Fire Extinguisher	-Gas Cylinder(s)	
-Refrigerator/Freezer	-Deionized Water	

Non-Controlled

ALS Environmental-Simi Valley Extraction Laboratory Floor Plan

Extraction Laboratory for
ALS Environmental

2360 Shasta Way, Unit G
Simi Valley, CA. 93065



Non-Controlled

APPENDIX E – Analytical Equipment

Equipment Description - Gas Chromatography	Purchased / Acquired	Location
Screen 02: Hewlett-Packard 5890 with FID/ECD Detectors	-	VOA GC/MS Screen
Screen 03: Hewlett-Packard 5890 with FID Detector	-	VOA GC/MS Screen
GC01: Hewlett-Packard 5890 with FID/TCD Detectors *Fixed Gas Analyzer/Total Combustion Analyzer (TCA)*	1995	VOA GC
GC03: Hewlett-Packard 5890 with ECD/FID Detectors *Hewlett-Packard 7673 Autosampler*	1995	SVOA
GC05: Hewlett-Packard 5890 Series II Combined with Sievers 355 (SCD 1)	1996	SVOA
GC06: Hewlett-Packard 6890 with ECD/ECD Detectors *Hewlett-Packard 6890 Autosampler*	1995	SVOA
GC07: Hewlett-Packard 6890 with FID/FID Detectors	1995	VOA GC
GC08: Hewlett-Packard 5890 Series II with TCD/FID Detectors	1998	VOA GC
GC09: Hewlett-Packard 5890 Series II with FID/ECD Detectors	1999	VOA GC/MS Screen
GC10: Hewlett-Packard 5890A with FID/TCD Detectors	1999	VOA GC
GC11: Hewlett-Packard 5890 Series II+ with FID Detector (Combined with MS01)	1999	SVOA
GC12: Hewlett-Packard 5890 Series II+ with FID Detector (Combined with MS02)	2004	SVOA
GC13: Agilent 6890A Combined with Sievers 355 (SCD 2)	2001	VOA GC
GC14: Agilent 6890N with NPD/FID Detectors *Agilent 7683B Autosampler*	2005	SVOA
GC15: Agilent 6890N with NPD/FID Detectors *Agilent 7683 Autosampler*	2005	SVOA
GC16: Agilent 6890N with PFPD Detector and *OI Detector Controller* *Agilent 7683 Autosampler*	2005	SVOA
GC19: Hewlett-Packard 5890 with FID Detector	2007	VOA GC
GC20: Agilent 7890A with FID/TCD Detectors	2008	VOA GC
GC21:Hewlett-Packard 5890 Series II with ECD/FID Detectors	2009	SVOA
GC22: Agilent 7890A Combined with Agilent 355 (SCD 3)	2009	VOA GC
GC23: Hewlett-Packard 6890+ with ECD Detector (Combined with MS14)	2007	SVOA
GC24: Hewlett-Packard 5890 Series II (Combined with MS04)	2011	VOA GC
GC25: Hewlett-Packard 5890 Series II (Combined with MS12)	2006	SVOA
GC26: Agilent 7890A (Combined with MS19)	2011	VOA GC/MS
GC27: Agilent 7890A (Combined with MS20)	2011	VOA GC/MS

Non-Controlled

Equipment Description - GC/MS Systems	Purchased / Acquired	Location
MS01: HP 5890 Series II+ with FID Detector (GC11) & HP 5971A MSD *Hewlett-Packard 7673 Autosampler*	1991	SVOA
MS02: HP 5890 Series II+ with FID Detector (GC12) & HP 5972 MSD *Hewlett-Packard 7673 Autosampler*	1994	SVOA
MS03: HP 6890A/5973 MSD *Tekmar AUTOCAN Autosampler*	1997	VOA GC/MS
MS04: HP 5890 Series II (GC24) & HP 5970 MSD	2004	VOA GC
MS05: Agilent 6890+/5973N MSD *Perkin Elmer TurboMatrix ATD-50 Thermal Desorber*	1999	VOA GC/MS
MS07: HP 6890A/ Agilent 5973N MSD *Tekmar AUTOCAN Autosampler*	2001	VOA GC/MS
MS08: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2004	VOA GC/MS
MS09: Agilent 6890N/5973inert MSD Tekmar AUTOCAN Autosampler	2005	VOA GC/MS
MS10: HP 6890A/5973 MSD *Hewlett-Packard 7673 Autosampler*	2006	SVOA
MS11: HP 5890 Series II/5972 MSD	2006	SVOA
MS12: HP 5890 Series II (GC25)/5971 MSD HP 7673 Autosampler	2006	SVOA
MS13: Agilent 6890N/5975B inert MSD Tekmar AUTOCAN Autosampler	2006	VOA GC/MS
MS14: HP 6890+ with ECD Detector (GC23) & HP 5973 MSD HP 6890 Injector	2007	SVOA
MS15: HP 5890 Series II/5972 MSD HP 7673 Autosampler	2007	SVOA
MS16: Agilent 6890N/5975C inert MSD Tekmar AUTOCAN Autosampler	2007	VOA GC/MS
MS17: Shimadzu GCMS QP-2010 Plus	2008	VOA GC/MS
MS18: Agilent 7890A /5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2010	VOA GC/MS
MS19: Agilent 7890A (GC26) & 5975C inert XL MSD Tekmar AUTOCAN Autosampler	2011	VOA GC/MS
MS20: Agilent 7890A (GC27) & /5975C inert XL MSD Markes Series 2 Unity Thermal Desorber Markes Series 2 Ultra TD Autosampler	2011	VOA GC/MS
MS21: Agilent 7890A (GC28) & 5975C inert XL MSD Tekmar AUTOCAN Autosampler	2012	VOA GC/MS

Non-Controlled

Liquid Chromatography	Purchased / Acquired	Location
LC03: Agilent Infinity LC 1220 (Combined with LCMS01)	2011	SVOA
LCMS01: Agilent 6120 Quadrupole MS (Combined with LC03)	2011	SVOA
Ion Chromatography	**Purchased / Acquired**	**Location**
IC03: Dionex ICS 2000 with Self-regenerating suppressor AS40 Autosampler	2008	GENCHEM
Spectrophotometer	**Purchased / Acquired**	**Location**
SPM01: Spectronic Instrument 20+ from SC	2001	GENCHEM
pH and Specific Ion Meters	**Purchased / Acquired**	**Location**
pH01: Thermo Orion 920 Selective Ion Meter	2001	GENCHEM
pH02: Orion 720A	1992	GENCHEM
Miscellaneous Equipment	**Purchased / Acquired**	**Location**
US Filter Water Purification System	2006	Main Lab
US Filter Water Purification System	2008	Extraction facility

Note: Purchase / Acquired year may represent when instrument was first maintained by ALS Environmental-Simi Valley or other in-network ALS Laboratory and does not reflect age of instrument.

Non-Controlled

Air sampling containers / Flow Controllers / Critical Orifices

Six-liter Summa passivated stainless steel canisters

- 956 Ambient
- 1042 Source
- 191 Standard

Six-liter Silonite passivated stainless steel canisters

- 512 Ambient
- 184 Source

Three-liter Silco passivated stainless steel canisters (69)

One-liter Summa passivated stainless steel canisters (1015)

One-liter Silonite passivated stainless steel canisters (57)

400-millilter mini passivated stainless steel canisters (18)

Low volume flow controllers for time integrated sampling

- 730 Ambient
- 103 Source

Low-flow flow controllers for multi-day sampling (59)

Mini-canister flow controllers for time integrated sampling (16)

Critical orifices (1931)

Critical orifices – Sulfur (160)

Automated Summa Canister Conditioning Units

- Twenty-four position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Ten position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Fourteen position, microprocessor controlled conditioners with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)
- Sixteen position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (2)
- Six position, microprocessor controlled conditioner with heater controller, vacuum gauge, humidified nitrogen fill capability and large-capacity vacuum pump (1)

Non-Controlled

APPENDIX F – Containers, Preservation and Holding Times

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time
Solid / Water Sample Analysis				
Bromide (EPA 9056)	S,W	P, FP, G	Cool, 4°C	28 Days
Chloride (EPA 9056)	S,W	P, FP, G	None Required	28 Days
Fluoride (9056)	S,W	P	Cool, 4°C	28 days
Hydrogen Ion - pH (EPA 9040B/9045C)	S,W	P, FP, G	None Required	Analyze immediately
Nitrate, Nitrite (EPA 9056)	S,W	P, FP, G	Cool, 4°C	48 hours
Orthophosphate (EPA 9056)	S	P,G	Cool, 4°C	48 hours
Formaldehyde, Acetaldehyde (EPA 8315A Procedure 1 Modified)	S,W	Glass w/Teflon-Lined Lid	Cool, 4°C	Aqueous – prep. - 72 hours, analysis – 30 days; Soil – prep. minimum, analysis – 30 days
Copper Corrosion (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-
H2S/Sulfur Emission (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-
Orthorhombic Cyclooctasulfur (In-House Method)	Solid Wallboard	Ziploc Bag, G	None Required	-

* W = Water or Aqueous solution; S = Soil or Sediment; P = Polyethylene, G = Glass, FP = fluoropolymer

Non-Controlled

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time	Sample Vol.[c]
Air Corrosivity	Air	Air Corrosivity Probes	Include 3 small dessicant bags (or equivalent) to each probe vial during shipment.	N/A[d]	3 Day Minimum Exposure
Amines (In-House Method)	Air	Treated Alumina Tubes	Sample Receipt-NA; Storage 4°C±2°C	30 days	100L
Ammonia (OSHA ID-188/ID-164)	Air	H_2SO_4 Treated Carbon Bead Tubes	Sample Receipt-NA; Storage 4°C±2°C	28 days	TWA: 24L STEL: 7.5L
BTU by ASTM D 3588 (SULFUR, ASTM D 5504; C1-C6+, EPA TO-3M; FIXED GASES, 3C)	Gaseous Fuels	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Sulfur (Bag – 24 hours; Canister[b] – 7 days) C1-C6+ (Bag – 72 hours; Canister[a] -30 days[b]) 3C (Bag – 72 hours; Canister[a] -30 days[b])	Bags – 500mL; Canisters – ≥1.0L
Carboxylic Acids (In-House Method)	Air	Treated Silica Gel Tubes	Sample Receipt-NA; Storage 4°C±2°C	30 days until extraction; 14 days for analysis	100L
Total Gaseous Non-methane Organics (TGNMO) (EPA 25C)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags - 500mL; Canisters – ≥1.0L
Fixed Gases (EPA 3C & ASTM D 1946)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags – 500mL; Canisters – ≥1.0L
Helium & Hydrogen (EPA 3C Modified)	Air	Summa Canister	N/A	Canister[a] – 30 days[b]	Bags – 500mL; Canisters – ≥1.0L
Argon (EPA 3C Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours[b]; Canister[a] – 30 days[b]	Bags – 500mL; Canisters – ≥1.0L
Methane, Ethane, Ethene, Propane, Propene (RSK 175)	Aqueous	Glass w/Teflon- Lined Lid	No Headspace; HCl to pH<2; 4°C±2°C	14 days when preserved	(3) 40mL Vials
Carbon Dioxide (RSK 175)	Aqueous	Glass w/Teflon Lined Lid	No Headspace; neutral pH (5-8); 4°C±2°C	N/A[d]	(3) 40mL Vials

Non-Controlled

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Maximum Holding Time	Sample Vol.[c]
Sulfur Compounds (In-House Method)	Aqueous	Glass w/Teflon- Lined Lid	No Headspace; pH>4; 4°C±2°C	Following pH adjustment – 24 hours	(2) 40mL Vials
Sulfur Compounds (ASTM D 5504; SCAQMD 307-91; Modified SCAQMD 307-91)	Air	Tedlar Bag, Fused Silica Lined Stainless Steel Canister	No direct sunlight	Bag – 24 hours; Canister[b] - 7 days	Bags – 500mL; Canisters – ≥1.0L
C_1-C_6+ (EPA TO-3 Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags – 500mL; Canisters – ≥1.0L
Methanol, Ethanol, Isopropyl alcohol, Freon, and Methylene Chloride (EPA TO-3 Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags 500mL; Canisters – ≥1.0L
Total Petroleum Hydrocarbons (TPHG) (EPA TO-3 Modified)	Air	Tedlar Bag, Mylar Bag, Summa Canister	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags – 500mL; Canisters – ≥1.0L
Pesticides and Polychlorinated Biphenyls (PCBs) (EPA TO-4A & TO-10A)	Air	Glass PUF Cartridge; TO-4A (High Volume); TO-10A (Low Volume)	Sample Receipt, <4°C; Store sample and extract at <4°C	7 days until extraction; extract – 40 days	2 m^3
Formaldehyde & Other Carbonyl Compounds (EPA TO-11A)	Air	DNPH-Coated Silica Gel Cartridge w/ Polypropylene Cap; SKC UME[x] and Bacharach GMD 570 Passive Monitors (formaldehyde only)	Sample Receipt, 4°C±2°C; Laboratory Preservation, 4°C±2	14 days until extraction; 30 days for analysis	100 – 150L
Polycyclic Aromatic Hydrocarbons (PAHs) (EPA TO-13A)	Air	Polyurethane Foam (PUF) plugs, XAD Tube, PUF / XAD-2	Sample Receipt, <4°C; Laboratory Preservation, <4°C	7 days until extraction; 40 days after	130 – 400 m^3
Volatile Organic Compounds (EPA TO-14A & TO-15)	Air	Tedlar Bag, Summa Canister (1L, 6L)	N/A	Bag – 72 hours; Canister – 30 days	Bags - 500mL; Canisters – 1.0L / 6.0L
Volatile Organic Compounds (EPA TO-17)	Air	Sorbent Tubes w/Swagelock Caps & PTFE Ferrules	<4°C; organic solvent free environment; Laboratory Storage, 4°C±2°C	30 days	1-4L
Air-Phase Petroleum Hydrocarbons (MADEP APH)	Air	Summa Canister	N/A	28 days	6.0L

Non-Controlled

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Holding Time	Sample Vol.[c]
Halogenated Volatile Organic Compounds (CARB 422)	Air	Tedlar Bag, Summa Canister (1L, 6L)	N/A	Bag – 72 hours; Canister[a] – 30 days[b]	Bags - 500mL; Canisters – 1.0L / 6.0L
Organic Vapors / NAPHTHAS (Diesel; etc.) (NIOSH 1550 / OSHA 7)	Air	Charcoal Tube; 3M 3500 or 3520 Badge; Silica Gel Tube w/ plastic caps	Sample Receipt-NA; Storage 4°C±2°C	14 days	Various
Sulfur Hexafluoride (NIOSH 6602 Modified)	Air	Tedlar Bag, Summa Canister (1L, 6L)	N/A	Bag[b] – 72 hours; Canister[a] – 30 days[b]	Bags - 500mL; Canisters – 1.0L / 6.0L
Siloxanes (In-House Method)	Air	SPE Cartidges, Tedlar Bags	N/A	14 days until extraction; Tedlar Bags – transfer onto sorbent tube within 72 hours. 30 days for analysis	30L – Cartridges Bags – 500ml
Methanol, Acetaldehyde, Methyl Ethyl Ketone, Propionaldehyde (NCASI – DI/MeOH 94.03 / NCASI – DI/HAPS 99.01)	Aqueous -Effluent	Glass w/Teflon Lined Lid	No Headspace; 4°C±2°C; HCl to pH 2-3 (Effluent only)	30 days	(1) 40mL Vial
Reduced Sulfur Compounds (NCASI Method RSC-02.02	Aqueous	40ml amber, borosilicate glass vials with Teflon faced silicone backed caps.	MeSH, DMS, and DMTS (RSCs non-H2S) addition of ascorbic acid and pH adjustment to <2.5 with 1:2 phosphoric acid solution upon collection. Laboratory Preservation, 4°C±2	14 days	(2) 40ml VOA Vials
Total Sulfide (NCASI Method RSC-02.02	Aqueous	40ml amber, borosilicate glass vials with Teflon faced silicone backed caps.	Addition of Zinc acetate solution and pH adjustment to >10 with 1 N NaOH solution upon collection. Laboratory Preservation, 4°C±2	14 days	(2) 40ml VOA Vials

Non Controlled

Sample Preservation and Holding Times for Performed Methods

Determination (Method)	Matrix	Container	Preservation	Holding Time	Sample Vol.[c]
Hydrofluoric Acid (In-House Method)	Air	Radiello Samplers	Laboratory Preservation, 4°C±2	4 months	15 minutes to 14 days exposure (dependent on sampling environment)
Hydrogen Sulfide (In-House Method)	Air	Radiello Samplers	N/A	6 months	1 hour to 15 days exposure (dependent on sampling environment)
Nitrogen Dioxide (In-House Method)	Air	Radiello samplers	Laboratory Preservation, store in dark at 4°C±2	4 months	7 to 15 days exposure (dependent on sampling environment)
Ozone (In-House Method)	Air	Radiello Samplers	Protect from light	7 days	24 hours to 14 days exposure (dependent on sampling environment)
Sulfur Dioxide (In-House Method)	Air	Radiello Samplers	Laboratory Preservation, store in dark at 4°C±2	4 months	7 to 15 days exposure (dependent on sampling environment)

Footnotes:

a.	Some methods do not specify the utilization of canisters; therefore, there is no required hold time and this will be noted in the case narrative.
b.	Laboratory recommended hold time; therefore, samples analyzed outside this hold time will be noted in the case narrative accordingly.
c.	Sample volumes are the minimum, which should be received by the laboratory; however, canister volumes should match the canister size utilized.
d.	There is no holding time requirement available and laboratory studies are not available indicating the validity of data prior to or following a specified length of time. Therefore, no holding time notation or qualifier will be adhered to results.

Non Controlled

APPENDIX G – Standard Operating Procedures

Corporate SOP Titles	SOP ID
Laboratory Ethics and Data Integrity	CE-GEN001
Records Management Policy	CE-GEN003
Preventive Action	CE-GEN004
Document Control	CE-GEN005
Data Recall	CE-GEN006
Procurement and Control of Laboratory Services and Supplies	CE-GEN007
Method Development	CE-GEN008
Establishing Standard Operating Procedures	CE-GEN009
Handling Customer Feedback	CE-GEN010
Assigning a TSR to a Project	CE-GEN011
Internal Audits	CE-QA001
Manual Integration Policy	CE-QA002
Training Policy	CE-QA003
Qualification of Subcontract Laboratories	CE-QA004
Laboratory Management Review	CE-QA005
Proficiency Testing Sample Analysis	CE-QA006
Making Entries onto Analytical Records	CE-QA007
Nonconformance and Corrective Action	CE-QA008
Control Limits	CE-QA009
Estimation of Uncertainty of Analytical Measurements	CE-QA010
Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation	CE-QA011
Quality of Standards and Reagents	CE-QA012

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Local Administrative SOP Titles	SOP Code
Data and Record Archiving	ADM-ARC
Batches and Sequences	ADM-BATCH_SEQ
Handling Consumable Materials	ADM-CONSUM
Electronic Data Backup, Archiving, and Restoration	ADM-DATA_BU
Data Review and Reporting	ADM-DATA_REV
Glassware Cleaning	ADM-GLASS
Analytical Instrument Acquisition, Reassignment, Maintenance and Documentation	ADM-INSTRUM
Laboratory Storage, Analysis, and Tracking	ADM-LabSAT
Media Request Fulfillment	ADM-Media_Req
Project Management	ADM-PMgmt
Software and Data Quality Assurance	ADM-SftwreQA
Significant Figures	ADM-SIG_FIG
Calibration and Use of Laboratory Support Equipment	ADM-SupEQ
Local Addendum to Corporate Manual Integration Policy	ADM-QA002_ADD
Local Addendum to Corporate Training Policy	ADM-QA003_ADD
Local Addendum to Corporate Qualification of Subcontract Laboratories	ADM-QA004_ADD
Waste Disposal	DSP-WASTE
Cleaning and Certification of Summa Canisters and Other Specially Prepared Canisters	SMO-Can_Cert
Evaluation and Pressurization of Specially Prepared Stainless Steel Canisters	SMO-Can_Press
Flow Controllers and Critical Orifices	SMO-Flow_Cntrl
Sample Receiving, Acceptance and Log-In	SMO-SMPL_REC

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Semi-Volatile SOP Titles	SOP Code
Determination of Formaldehyde and Other Carbonyl Compounds in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC) EPA Compendium Method T0-11A	SVO-11A
Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatography/Mass Spectrometry (GC/MS)	SVO-13A
Determination of Volatile Amines in Ambient Air Using GC/NPD	SVO-AMINES
Determination of Carboxylic Acids in Ambient Air Using GC/MS	SVO-CACIDS
Analysis of Halogenated Volatile Organic Compounds in Emissions from Stationary Sources using GC/ECD in Accordance with a Modification of CARB Method 422	SVO-CARB422
NCASI Method RSC-02.02 Reduced Sulfur Compounds by Direct Injection GC/PFPD	SVO-NCASI_RSC
Determination of Organic Vapors Using GC/FID in Accordance with OSHA Method 07	SVO-OSHA_07
Preparation and Analysis of Orthorhombic Cyclooctasulfur by Gas Chromatography/Electron Capture Detector (GC/ECD)	SVO-S8_ECD
Preparation and Analysis of Orthorhombic Cyclooctasulfur by Gas Chromatography/Mass Spectrometry (GC/MS)	SVO-S8_MS
Analysis of Sulfur Hexafluoride in Accordance with a Modification of NIOSH 6602	SVO-SF6
Determination of Siloxanes in Biogas using Gas Chromatography/Mass Spectrometry (GC/MS)	SVO-SILOXANES
Determination of Pesticides and Polychlorinated Biphenyls (PCBs) in Ambient Air by GC/ECD per EPA Compendium Methods TO-4 and TO-10A	SVO-TO4A
Sample and Media Preparation per EPA Compendium Method TO-13A	SVP-TO13A
Sample Extraction and Preparation of Pesticide and PCB Samples According to EPA Compendium Methods TO-4A and TO-10A	SVP-TO4A

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Volatile SOP Titles	SOP Code
Analysis of Air Corrosivity by Checkmate Meter	VOA-AIRCORR
Analysis of Argon Using Gas Chromatography with Thermal Conductivity Detection (TCD)	VOA-ARGON
Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels in Accordance with ASTM D 3588	VOA-BTU
Samples Preparation in Glass Chambers	VOA-CHAMBER
Dissolved Gas Analysis in Aqueous Samples Using a GC Headspace Equilibration Technique	VOA-DISGAS
Sample Preparation of Drywall for Sulfur Analysis and the Determination of Copper Corrosion	VOA-DRYWALL
Determination of Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases in Accordance with EPA Method 25C	VOA-EPA25C
Determination of Methane, Carbon Monoxide, Carbon Dioxide, and Total Gaseous Nonmethane Organic (TGNMO) Emissions as Carbon in Landfill Gases According to Modified EPA Method 25C	VOA-EPA25CM
Determination of Hydrogen, Carbon Monoxide, Carbon Dioxide, Nitrogen, Methane, and Oxygen using Gas Chromatography with Thermal Conductivity Detection (TCD) in Accordance with EPA 3C or ASTM D 1946	VOA-EPA3C
Analysis of Hydrogen and Helium using Gas Chromatography with Thermal Conductivity Detection (TCD)	VOA-HHe
Analysis of Sulfur Compounds in a Gaseous Matrix by Gas Chromatography with Sulfur Chemiluminescence Detection per ASTM D 5504 and Modified SCAQMD Method 307	VOA-S307M_SCD
Analysis of Sulfur Compounds in Liquid Samples by Gas Chromatography with Sulfur Chemiluminescence Detection	VOA-SH_2O_SCD
Analysis of C1-C6+ using Gas Chromatography with Flame Ionization Detection (FID) in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3C1C6
Analysis of Various Compounds using Gas Chromatography with Flame Ionization Detection (FID) in Accordance with a Modification of EPA Compendium Method TO-3	VOA-TO3MeOH
Analysis of Total Petroleum Hydrocarbons as Gasoline in Air by Gas Chromatography with Flame Ionization Detection	VOA-TPHG_TO3
Determination of Air-Phase Petroleum Hydrocarbons by Gas Chromatography/Mass Spectrometry (GC/MS)	VOA-MAPH
Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)	VOA-TO15; CASS TO-15/GC-MS
Determination of Volatile Organic Compounds in Ambient Air Using Active or Passive Sampling Onto Sorbent Tubes	VOA-TO17; CASS TO-17/GC-MS

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General Chemistry (WET) SOP Titles	SOP Code
Determination of Inorganic Anions by Ion Chromatography	WET-Anions_IC
Hexavalent Chromium: Colorimetric, Liquids	WET-Cr6L
Hydrogen Sulfide (H_2S) in Air, Colorimetric	WET-H_2S Air
Analysis of Hydrofluoric (HF) Acid in Air by Ion Selective Electrode	WET-HFAir
Ammonia in Air by Ion Selective Electrode	WET-NH_3Air
Colorimetric Determination of Nitrogen Dioxide (NO_2) in Air	WET-NO_2Air
Ozone (O_3) in Air, Colorimetric	WET-O_3Air
pH Electrometric Measurement for Liquids by Ion Selective Electrodes	WET-pHL
pH Electrometric Measurement for Solids by Ion Selective Electrodes	WET-pHS

Non-Controlled

APPENDIX H – Data Qualifiers

CODE	CATEGORY	DESCRIPTION
BC	AIHA	Reported results are not blank corrected.
BH	AIHA	Results indicate breakthrough; back section of tube greater than front section.
BT	AIHA	Results indicated possible breakthrough; back section ≥10% front section.
DE	AIHA	Reported results are corrected for desorption efficiency.
RA	AIHA	Result not available.
G	GENERAL	Improper container.
G1	GENERAL	Unpreserved or improperly preserved sample.
X	GENERAL	See case narrative.
H1	HOLD TIME	Sample analysis performed past holding time. See case narrative.
H2	HOLD TIME	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3	HOLD TIME	Sample was received and analyzed past holding time.
H4	HOLD TIME	Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
i	MATRIX	The MDL/MRL has been elevated due to matrix interference.
M	MATRIX	Matrix interference; results may be biased (high/low).
M1	MATRIX	Matrix interference due to coelution with a non-target compound. (TO-15 only)
Q	PETROLEUM	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter/heavier molecular weight constituents than the calibration standard.
Y	PETROLEUM	The chromatogram resembles a petroleum product but does not match the calibration standard.
Z	PETROLEUM	The chromatogram does not resemble a petroleum product.
#	QC	The control limit criterion is not applicable. See case narrative.
*	QC	The result is an outlier. See case narrative.
B	QC	Analyte detected in both the sample and associated method blank.
I	QC	Internal standard not within the specified limits. See case narrative.
L	QC	Laboratory control sample recovery outside the specified limits; results may be biased (high/low).
N	QC	The matrix spike sample recovery is not within control limits. See case narrative.
R	QC	Duplicate precision not met.

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CODE	CATEGORY	DESCRIPTION
R1	QC	Duplicate precision not within the specified limits; however, the results are below the MRL and considered estimated.
S	QC	Surrogate recovery not within specified limits.
V	QC	The continuing calibration verification standard was outside (biased high/low) the specified limits for this compound.
C	RESULT	Result identification confirmed.
CE	RESULT	Co-elution.
D	RESULT	The reported result is from a dilution.
E	RESULT	Estimated; concentration exceeded calibration range.
J	RESULT	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
J1	RESULT	The analyte was positively identified below the method reporting limit prior to utilizing the dilution factor; the associated numerical value is considered estimated.
K	RESULT	Analyte was detected above the method reporting limit prior to normalization.
ND	RESULT	Compound was analyzed for, but not detected above the laboratory reporting/detection limit.
P	RESULT	The confirmation criterion was exceeded. The relative percent difference was greater than 40/25% between the two analytical results.
U	RESULT	Compound was analyzed for, but not detected (ND) at or above the MRL/MDL.
W	RESULT	Result quantified, but the corresponding peak was detected outside the generated retention time window.
UJ	RESULT	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
Ui	RESULT	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL; however, the MRL/MDL has been elevated due to matrix interference.
T	TIC	Analyte is a tentatively identified compound, result is estimated.

Non-Controlled

APPENDIX I – Master List of Controlled Documents

Controlled Documents*	Document Code
Health and Safety Manual	ADM-SAFETY
Quality Assurance Manual	ALSMV-QAM

*Refer to Appendix G for a list of the laboratory's controlled standard operating procedures.

QA Program Files	
Item	**Location / Name**
Simi Valley Certification Status	Q:\Certifications\Cert Status.xls
Control Limit\Chart Status	Q:\Control Charts\CntrlChrt(status1).xls
MDL,LOD,LOQ Status	Q:\MDL Status\MDL Status Table (EACH DEPT).xls
Technical Training Status	Q:\Training\TRAINING STATUS\TRAINING STATUS.xls
Simi Valley Data Quality Objectives	Q:\MDL_MRL\DQO Spreadsheet.xls
Master List of Controlled Documents (Logbooks, SOPs, etc.)	Q:\Master List of Controlled Documents\Master List of Controlled Documents.xls
Personnel Resumes, Transcripts	HR and QA Departments
Job Descriptions	HR Department
Approved Signatories List	QA Manual Appendix I

Non-Controlled

Approved Signatories	
Name	**Title**
Kelly Horiuchi, B.A.	Laboratory Director / Project Manager
Chaney Humphrey, B.S.	Quality Assurance Manager
Wade Henton, B.S.	Volatiles (GC) Technical Manager
Chris Parnell, B.S.	Operations Manager; Technical Manager (VOA GC/MS – Air)
Madeleine Dangazyan, B.S.	Semi-Volatiles/ Industrial Hygiene Technical Manager; Environmental Health & Safety Coordinator
Wida Ang, B.S., M.S.	Team Leader (Volatiles GC/MS – Air)
Sue Anderson, B.S.	Project Manager / Technical Manager (General Chemistry)
Samantha Henningsen, B.S.	Project Manager
Kathleen Aguilera, B.A.	Client Services Manager / Project Manager

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APPENDIX J – Laboratory Accreditations

American Industrial Hygiene Association (AIHA)

Industrial Hygiene Laboratory Accreditation Program Laboratory
Laboratory # 101661
Approved Method(s):

- NIOSH 1450
- NIOSH 1457
- NIOSH 1500
- NIOSH 1501
- NIOSH 1550
- OSHA 07

State of Arizona, Department of Health Services

License No. AZ0694
Approved Method(s):

- EPA TO-15

Department of Defense, Environmental Laboratory Accreditation Program (DoD-ELAP)

Perry Johnson Laboratory Accreditation, Inc. Certificate No. L11 – 203
Approved Method(s):

- EPA TO-15
- RSK 175
- EPA 3C
- ASTM D 1946-90
- SOP VOA-EPA3C (EPA 3C Modified)
- SOP VOA-TPHG_TO3 (JP-4 and TPHG by Modified EPA TO-3)
- SOP VOA-TO3C1C6 (Hydrocarbons and ranges by Modified EPA TO-3)
- SOP VOA-TO15 (EPA TO-15 Modified)

State of Florida, Department of Health (NELAP-Primary)

Laboratory ID No.: E871020
Approved Method(s):

- EPA TO-13A
- EPA TO-15
- EPA TO-17
- EPA TO-4A
- EPA TO-10A
- MADEP APH

State of Maine, Department of Health and Human Services

Laboratory ID: CA01527
Certificate No.: 2012039
Approved Methods

- EPA TO-15
- MADEP APH

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State of Minnesota, Department of Health, Environmental Laboratory Certification Program (NELAP-Secondary)
Laboratory ID: 006-999-456
Approved Method(s):
- EPA TO-15

State of New York, Department of Health (NELAP –Secondary)
Environmental Analyses/Air and Emissions
Laboratory ID No. 11221
Approved Method(s):
- EPA TO-13A
- EPA TO-15
- EPA TO-17

State of New Jersey, Department of Environmental Protection (NELAP-Secondary)
Laboratory ID: CA009
Approved Method(s):
- EPA TO-15

State of Oregon, Environmental Laboratory Accreditation Program (NELAP-Secondary)
Laboratory ID: CA200007
Approved Method(s):
- EPA TO-15

Commonwealth of Pennsylvania, Department of Environmental Protection Bureau of Laboratories
Registration Number: 68-03307

State of Texas, Texas Commission on Environmental Quality (NELAP-Secondary)
Certificate # T104704413-13-4
Approved Method(s):
- EPA TO-15

State of Utah, Department of Health, Environmental Laboratory Certification Program (NELAP-Secondary)
Certificate # CA016272013-3
Approved Method(s):
- EPA TO-15

State of Washington, Department of Ecology
Laboratory ID: C946
Approved Method(s):
- EPA TO-15
- EPA RSK-175

Non-Controlled

Note 1: This Quality Assurance Manual is revised annually with AIHA, DoD and NELAP-Primary Certificates, and the Scope of Accreditations/Parameters are revised annually (where necessary). During this interim period Certificates may expire and the Scope of Accreditations/Parameters may change; therefore, these may not be updated until the next revision.

Note 2: Current Certificates and Scope of Accreditations/Parameters are on file and displayed in the front hallway. Updated or Specific Certificates and Scope of Accreditations/Parameters are available upon request.

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AIHA Laboratory Accreditation Programs, LLC

acknowledges that

ALS Environmental – Simi Valley
2655 Park Center Drive, Suite A, Simi Valley, CA 93065-6200
Laboratory ID: 101661

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories* in the following:

LABORATORY ACCREDITATION PROGRAMS

✓	**INDUSTRIAL HYGIENE**	Accreditation Expires: 11/01/2014
☐	**ENVIRONMENTAL LEAD**	Accreditation Expires:
☐	**ENVIRONMENTAL MICROBIOLOGY**	Accreditation Expires:
☐	**FOOD**	Accreditation Expires:
☐	**UNIQUE SCOPES**	Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation**. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2005 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

Larry S. Pierce
Chairperson, Analytical Accreditation Board

Cheryl O. Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision 13: 03/12/2013

Date Issued: 04/25/2013

Non-Controlled

AIHA Laboratory Accreditation Programs, LLC
SCOPE OF ACCREDITATION

ALS Environmental – Simi Valley
2655 Park Center Drive, Suite A, Simi Valley, CA 93065-6200

Laboratory ID: **101661**
Issue Date: 04/25/2013

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or withdrawal of accreditation.

Industrial Hygiene Laboratory Accreditation Program (IHLAP)

Initial Accreditation Date: 09/01/1994

IHLAP Scope Category	Field of Testing (FoT)	Technology sub-type/ Detector	Published Reference Method/Title of In-house Method	Method Description or Analyte *(for internal methods only)*
Chromatography Core	Gas Chromatography	GC/FID	NIOSH 1450	
			NIOSH 1457	
			NIOSH 1500	
			NIOSH 1501	
			NIOSH 1550	
			OSHA 07	
	Gas Chromatography (Diffusive Samplers)		OSHA 07	

A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA-LAP, LLC website at: http://www.aihaaccreditedlabs.org

Effective: 03/12/2013
101661_Scope_IHLAP (Name Change)_2013_04_25
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Non-Controlled

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental
2655 Park Center Drive, Suite A, Simi Valley, CA 93065

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 4.2 10/26/2010 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Accreditation No.:*	*Certificate No.:*
January 11, 2010	December 26, 2011	65818	L11-203

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Aqueous	RSK 175	GC/FID	Methane
Aqueous	RSK 175	GC/FID	Ethane
Aqueous	RSK 175	GC/FID	Ethene
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Hydrogen
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Oxygen
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Nitrogen
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Methane
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Carbon Dioxide
Air	(CAS SOP) VOA-EPA3C	GC/TCD	Carbon Monoxide
Air	(CAS SOP) VOA-TPHG_TO3	GC/FID	Total Petroleum Hydrocarbons Gasoline (TPHG)
Air	(CAS SOP) VOA-TPHG_TO3	GC/FID	JP-4
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	C1 - C6+
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Ethane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Ethene
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Methane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	n-Butane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	n-Hexane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	n-Pentane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Propane
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Propene
Air	(CAS SOP) VOA-TO3C1C6	GC/FID	Total Volatile Petroleum Hydrocarbons (TVPH) as Hexane
Air	EPA TO-15	GC/MS	1,1,1-Trichloroethane
Air	EPA TO-15	GC/MS	1,1,2,2-Tetrachloroethane
Air	EPA TO-15	GC/MS	1,1,2-Trichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethane
Air	EPA TO-15	GC/MS	1,1-Dichloroethene
Air	EPA TO-15	GC/MS	1,2,3-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2,4-Trichlorobenzene

Non-Controlled

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	EPA TO-15	GC/MS	1,2,4-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,2,Dibromo-3-Chloropropane
Air	EPA TO-15	GC/MS	1,2-Dibromoethane
Air	EPA TO-15	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
Air	EPA TO-15	GC/MS	1,2-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,2-Dichloroethane
Air	EPA TO-15	GC/MS	1,2-Dichloropropane
Air	EPA TO-15	GC/MS	1,3,5-Trimethylbenzene
Air	EPA TO-15	GC/MS	1,3-Butadiene
Air	EPA TO-15	GC/MS	1,3-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dichlorobenzene
Air	EPA TO-15	GC/MS	1,4-Dioxane
Air	EPA TO-15	GC/MS	1-Butanol
Air	EPA TO-15	GC/MS	2-Butanone (MEK)
Air	EPA TO-15	GC/MS	2-Ethyltoluene
Air	EPA TO-15	GC/MS	2-Hexanone
Air	EPA TO-15	GC/MS	3-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Ethyltoluene
Air	EPA TO-15	GC/MS	4-Methyl-2-Pentanone
Air	EPA TO-15	GC/MS	Acetone
Air	EPA TO-15	GC/MS	Acetonitrile
Air	EPA TO-15	GC/MS	Acrolein
Air	EPA TO-15	GC/MS	Acrylonitrile
Air	EPA TO-15	GC/MS	Allyl Chloride
Air	EPA TO-15	GC/MS	alpha-Methylstyrene
Air	EPA TO-15	GC/MS	alpha-Pinene
Air	EPA TO-15	GC/MS	Benzene
Air	EPA TO-15	GC/MS	Benzyl Chloride
Air	EPA TO-15	GC/MS	Bromodichloromethane
Air	EPA TO-15	GC/MS	Bromoform
Air	EPA TO-15	GC/MS	Bromomethane
Air	EPA TO-15	GC/MS	Carbon Disulfide
Air	EPA TO-15	GC/MS	Carbon Tetrachloride
Air	EPA TO-15	GC/MS	Chlorobenzene
Air	EPA TO-15	GC/MS	Chloroethane

Non-Controlled

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	EPA TO-15	GC/MS	Chloroform
Air	EPA TO-15	GC/MS	Chloromethane
Air	EPA TO-15	GC/MS	cis-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	cis-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Cumene
Air	EPA TO-15	GC/MS	Cyclohexane
Air	EPA TO-15	GC/MS	Cyclohexanone
Air	EPA TO-15	GC/MS	Dibromochloromethane
Air	EPA TO-15	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	EPA TO-15	GC/MS	Diisopropyl Ether
Air	EPA TO-15	GC/MS	d-Limonene
Air	EPA TO-15	GC/MS	Ethanol
Air	EPA TO-15	GC/MS	Ethyl Acetate
Air	EPA TO-15	GC/MS	Ethyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Ethylbenzene
Air	EPA TO-15	GC/MS	Hexachlorobutadiene
Air	EPA TO-15	GC/MS	Isooctane
Air	EPA TO-15	GC/MS	Isopropyl acetate
Air	EPA TO-15	GC/MS	Isopropyl Alcohol
Air	EPA TO-15	GC/MS	m-&, p-Xylenes
Air	EPA TO-15	GC/MS	Methyl Methacrylate
Air	EPA TO-15	GC/MS	Methyl tert-Butyl Ether
Air	EPA TO-15	GC/MS	Methylene Chloride
Air	EPA TO-15	GC/MS	Naphthalene
Air	EPA TO-15	GC/MS	n-Butyl Acetate
Air	EPA TO-15	GC/MS	n-Butylbenzene
Air	EPA TO-15	GC/MS	n-Decane
Air	EPA TO-15	GC/MS	n-Dodecane
Air	EPA TO-15	GC/MS	n-Heptane
Air	EPA TO-15	GC/MS	n-Hexane
Air	EPA TO-15	GC/MS	n-Nonane

Issue: 12/11 *This supplement is in conjunction with certificate #L11-203* *Page 4 of 8*

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	EPA TO-15	GC/MS	n-Octane
Air	EPA TO-15	GC/MS	n-Propylbenzene
Air	EPA TO-15	GC/MS	n-Undecane
Air	EPA TO-15	GC/MS	o-Xylene
Air	EPA TO-15	GC/MS	p-Isopropyltoluene
Air	EPA TO-15	GC/MS	Propene
Air	EPA TO-15	GC/MS	sec-Butylbenzene
Air	EPA TO-15	GC/MS	Styrene
Air	EPA TO-15	GC/MS	tert-Amyl Methyl Ether
Air	EPA TO-15	GC/MS	tert-Butanol
Air	EPA TO-15	GC/MS	tert-Butylbenzene
Air	EPA TO-15	GC/MS	Tetrachloroethene
Air	EPA TO-15	GC/MS	Tetrahydrofuran
Air	EPA TO-15	GC/MS	Toluene
Air	EPA TO-15	GC/MS	trans-1,2-Dichloroethene
Air	EPA TO-15	GC/MS	trans-1,3-Dichloropropene
Air	EPA TO-15	GC/MS	Trichloroethene
Air	EPA TO-15	GC/MS	Trichlorofluoromethane
Air	EPA TO-15	GC/MS	Trichlorotrifluoroethane
Air	EPA TO-15	GC/MS	Vinyl Acetate
Air	EPA TO-15	GC/MS	Vinyl Chloride
Air	ASTM D 1946-90	GC/TCD	Hydrogen
Air	ASTM D 1946-90	GC/TCD	Oxygen
Air	ASTM D 1946-90	GC/TCD	Nitrogen
Air	ASTM D 1946-90	GC/TCD	Methane
Air	ASTM D 1946-90	GC/TCD	Carbon Dioxide
Air	ASTM D 1946-90	GC/TCD	Carbon Monoxide
Air	EPA 3C	GC/TCD	Oxygen
Air	EPA 3C	GC/TCD	Nitrogen
Air	EPA 3C	GC/TCD	Methane
Air	EPA 3C	GC/TCD	Carbon Dioxide
Air	(CAS SOP) VOA-TO15	GC/MS	1,1,1-Trichloroethane
Air	(CAS SOP) VOA-TO15	GC/MS	1,1,2,2-Tetrachloroethane
Air	(CAS SOP) VOA-TO15	GC/MS	1,1,2-Trichloroethane
Air	(CAS SOP) VOA-TO15	GC/MS	1,1-Dichloroethane

Non-Controlled

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	(CAS SOP) VOA-TO15	GC/MS	1,1-Dichloroethene
Air	(CAS SOP) VOA-TO15	GC/MS	1,2,3-Trimethylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,2,4-Trichlorobenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,2,4-Trimethylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dibromo-3-Chloropropane
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dibromoethane
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dichlorobenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dichloroethane
Air	(CAS SOP) VOA-TO15	GC/MS	1,2-Dichloropropane
Air	(CAS SOP) VOA-TO15	GC/MS	1,3,5-Trimethylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,3-Butadiene
Air	(CAS SOP) VOA-TO15	GC/MS	1,3-Dichlorobenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,4-Dichlorobenzene
Air	(CAS SOP) VOA-TO15	GC/MS	1,4-Dioxane
Air	(CAS SOP) VOA-TO15	GC/MS	1-Butanol
Air	(CAS SOP) VOA-TO15	GC/MS	2-Butanone (MEK)
Air	(CAS SOP) VOA-TO15	GC/MS	2-Ethyltoluene
Air	(CAS SOP) VOA-TO15	GC/MS	2-Hexanone
Air	(CAS SOP) VOA-TO15	GC/MS	3-Ethyltoluene
Air	(CAS SOP) VOA-TO15	GC/MS	4-Ethyltoluene
Air	(CAS SOP) VOA-TO15	GC/MS	4-Methyl-2-Pentanone
Air	(CAS SOP) VOA-TO15	GC/MS	Acetone
Air	(CAS SOP) VOA-TO15	GC/MS	Acetonitrile
Air	(CAS SOP) VOA-TO15	GC/MS	Acrolein
Air	(CAS SOP) VOA-TO15	GC/MS	Acrylonitrile
Air	(CAS SOP) VOA-TO15	GC/MS	Allyl Chloride
Air	(CAS SOP) VOA-TO15	GC/MS	alpha-Methylstyrene
Air	(CAS SOP) VOA-TO15	GC/MS	alpha-Pinene
Air	(CAS SOP) VOA-TO15	GC/MS	Benzene
Air	(CAS SOP) VOA-TO15	GC/MS	Benzyl Chloride
Air	(CAS SOP) VOA-TO15	GC/MS	Bromodichloromethane
Air	(CAS SOP) VOA-TO15	GC/MS	Bromoform
Air	(CAS SOP) VOA-TO15	GC/MS	Bromomethane

Issue: 12/11 *This supplement is in conjunction with certificate #L11-203* *Page 6 of 8*

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	(CAS SOP) VOA-TO15	GC/MS	Carbon Disulfide
Air	(CAS SOP) VOA-TO15	GC/MS	Carbon Tetrachloride
Air	(CAS SOP) VOA-TO15	GC/MS	Chlorobenzene
Air	(CAS SOP) VOA-TO15	GC/MS	Chloroethane
Air	(CAS SOP) VOA-TO15	GC/MS	Chloroform
Air	(CAS SOP) VOA-TO15	GC/MS	Chloromethane
Air	(CAS SOP) VOA-TO15	GC/MS	cis-1,2-Dichloroethene
Air	(CAS SOP) VOA-TO15	GC/MS	cis-1,3-Dichloropropene
Air	(CAS SOP) VOA-TO15	GC/MS	Cumene
Air	(CAS SOP) VOA-TO15	GC/MS	Cyclohexane
Air	(CAS SOP) VOA-TO15	GC/MS	Cyclohexanone
Air	(CAS SOP) VOA-TO15	GC/MS	Dibromochloromethane
Air	(CAS SOP) VOA-TO15	GC/MS	Dichlorodifluoromethane (CFC 12)
Air	(CAS SOP) VOA-TO15	GC/MS	Diisopropyl Ether
Air	(CAS SOP) VOA-TO15	GC/MS	d-Limonene
Air	(CAS SOP) VOA-TO15	GC/MS	Ethanol
Air	(CAS SOP) VOA-TO15	GC/MS	Ethyl Acetate
Air	(CAS SOP) VOA-TO15	GC/MS	Ethyl tert-Butyl Ether
Air	(CAS SOP) VOA-TO15	GC/MS	Ethylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	Hexachlorobutadiene
Air	(CAS SOP) VOA-TO15	GC/MS	Isooctane
Air	(CAS SOP) VOA-TO15	GC/MS	Isopropyl acetate
Air	(CAS SOP) VOA-TO15	GC/MS	Isopropyl Alcohol
Air	(CAS SOP) VOA-TO15	GC/MS	m-&,p-Xylenes
Air	(CAS SOP) VOA-TO15	GC/MS	Methyl Methacrylate
Air	(CAS SOP) VOA-TO15	GC/MS	Methyl tert-Butyl Ether
Air	(CAS SOP) VOA-TO15	GC/MS	Methylene Chloride
Air	(CAS SOP) VOA-TO15	GC/MS	Naphthalene
Air	(CAS SOP) VOA-TO15	GC/MS	n-Butyl Acetate
Air	(CAS SOP) VOA-TO15	GC/MS	n-Butylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	n-Decane
Air	(CAS SOP) VOA-TO15	GC/MS	n-Dodecane
Air	(CAS SOP) VOA-TO15	GC/MS	n-Heptane
Air	(CAS SOP) VOA-TO15	GC/MS	n-Hexane
Air	(CAS SOP) VOA-TO15	GC/MS	n-Nonane

Issue: 12/11 *This supplement is in conjunction with certificate #L11-203* *Page 7 of 8*

Non-Controlled

Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental

2655 Park Center Drive, Suite A, Simi Valley, CA 93065
Chaney Humphrey Phone: 805-526-7161

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard Method	Technology	Analyte
Air	(CAS SOP) VOA-TO15	GC/MS	n-Octane
Air	(CAS SOP) VOA-TO15	GC/MS	n-Propylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	n-Undecane
Air	(CAS SOP) VOA-TO15	GC/MS	o-Xylene
Air	(CAS SOP) VOA-TO15	GC/MS	p-Isopropyltoluene
Air	(CAS SOP) VOA-TO15	GC/MS	Propene
Air	(CAS SOP) VOA-TO15	GC/MS	sec-Butylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	Styrene
Air	(CAS SOP) VOA-TO15	GC/MS	tert-Amyl Methyl Ether
Air	(CAS SOP) VOA-TO15	GC/MS	t-Butanol
Air	(CAS SOP) VOA-TO15	GC/MS	tert-Butylbenzene
Air	(CAS SOP) VOA-TO15	GC/MS	Tetrachloroethene
Air	(CAS SOP) VOA-TO15	GC/MS	Tetrahydrofuran
Air	(CAS SOP) VOA-TO15	GC/MS	Toluene
Air	(CAS SOP) VOA-TO15	GC/MS	trans-1,2-Dichloroethene
Air	(CAS SOP) VOA-TO15	GC/MS	trans-1,3-Dichloropropene
Air	(CAS SOP) VOA-TO15	GC/MS	Trichloroethene
Air	(CAS SOP) VOA-TO15	GC/MS	Trichlorofluoromethane
Air	(CAS SOP) VOA-TO15	GC/MS	Trichlorotrifluoroethane
Air	(CAS SOP) VOA-TO15	GC/MS	Vinyl Acetate
Air	(CAS SOP) VOA-TO15	GC/MS	Vinyl Chloride

Non-Controlled

State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E871020

ALS ENVIRONMENTAL - SIMI VALLEY
2655 PARK CENTER DRIVE, SUITE A
SIMI VALLEY, CA 93065

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

AIR AND EMISSIONS - EXTRACTABLE ORGANICS, AIR AND EMISSIONS - PESTICIDES-HERBICIDES-PCB'S, AIR AND EMISSIONS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2013 Expiration Date: June 30, 2014

Victor Johnson, Director
Division of Emergency Preparedness and Community Support
DH Form 1697, 7/04
NON-TRANSFERABLE E871020-12-07/01/2013
Supersedes all previously issued certificates

Non-Controlled

Rick Scott
Governor

John H. Armstrong, MD, FACS
State Surgeon General & Secretary

Laboratory Scope of Accreditation

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Attachment to Certificate #: E871020-12, expiration date June 30, 2014. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1-Trichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,1-Trichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2,2-Tetrachloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2,2-Tetrachloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1,2-Trichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1,2-Trichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1-Dichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1-Dichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,1-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,1-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2,3-Trimethylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
1,2,4-Trichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2,4-Trichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2,4-Trimethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2,4-Trimethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,2-Dichloropropane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,2-Dichloropropane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3,5-Trimethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3,5-Trimethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3-Butadiene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3-Butadiene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,3-Butadiene	MADEP APH	Volatile Organics	NELAP	12/21/2012
1,3-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,3-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program. **Issue Date: 7/1/2013** **Expiration Date: 6/30/2014**

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Laboratory Scope of Accreditation

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Attachment to Certificate #: E871020-12, expiration date June 30, 2014. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,4-Dichlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,4-Dichlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
1,4-Dioxane (1,4-Diethyleneoxide)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
1,4-Dioxane (1,4-Diethyleneoxide)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2,2,4-Trimethylpentane	EPA TO-15	Volatile Organics	NELAP	7/9/2010
2,2,4-Trimethylpentane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
2-Hexanone	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
2-Hexanone	EPA TO-17	Volatile Organics	NELAP	7/9/2010
4,4'-DDD	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4,4'-DDD	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4,4'-DDE	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4,4'-DDE	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4,4'-DDT	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4,4'-DDT	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
4-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
4-Methyl-2-pentanone (MIBK)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
4-Methyl-2-pentanone (MIBK)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acenaphthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Acenaphthylene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Acetone	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Acetone	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acetonitrile	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Acetonitrile	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Acrolein (Propenal)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Acrylonitrile	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Aldrin	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Aldrin	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Allyl chloride (3-Chloropropene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
alpha-Chlordane	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
alpha-Chlordane	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
alpha-Methylstyrene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007

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Attachment to Certificate #: E871020-12, expiration date June 30, 2014. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
APH Aliphatics C5-C8	MADEP APH	Volatile Organics	NELAP	12/21/2012
APH Aliphatics C9-C12	MADEP APH	Volatile Organics	NELAP	12/21/2012
APH Aromatics C9-C10	MADEP APH	Volatile Organics	NELAP	12/21/2012
a-Pinene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Aroclor-1016 (PCB-1016)	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Aroclor-1016 (PCB-1016)	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Aroclor-1260 (PCB-1260)	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Aroclor-1260 (PCB-1260)	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Benzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Benzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Benzene	MADEP APH	Volatile Organics	NELAP	12/21/2012
Benzo(a)anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(a)pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(b)fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(g,h,i)perylene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzo(k)fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Benzyl chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
beta-BHC (beta-Hexachlorocyclohexane)	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
beta-BHC (beta-Hexachlorocyclohexane)	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Bromodichloromethane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Bromodichloromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Bromoform	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Bromoform	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Carbon disulfide	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Carbon disulfide	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Carbon tetrachloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Carbon tetrachloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chlorobenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chlorobenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chloroethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chloroethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chloroform	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Chloroform	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Chrysene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
cis-1,2-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007

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State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
cis-1,2-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
cis-1,3-Dichloropropene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
cis-1,3-Dichloropropene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Cyclohexane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Cyclohexane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Cyclohexanone	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
delta-BHC	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Dibenz(a,h)anthracene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Dibromochloromethane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Dibromochloromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Dichlorodifluoromethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Dichlorodifluoromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Dieldrin	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Dieldrin	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Di-isopropylether (DIPE)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
D-Limonene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Endosulfan I	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endosulfan II	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endosulfan sulfate	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endrin	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endrin	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endrin aldehyde	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endrin aldehyde	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Endrin ketone	CASS SOP SVP-TO4A/GC-ECD	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Ethanol	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Ethanol	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Ethyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Ethylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Ethylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Ethylbenzene	MADEP APH	Volatile Organics	NELAP	12/21/2012
Ethyl-t-butylether (ETBE)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Fluoranthene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Fluorene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012

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State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
gamma-Chlordane	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
gamma-Chlordane	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Heptachlor	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Heptachlor	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Heptachlor epoxide	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Heptachlor epoxide	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Hexachlorobutadiene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Hexachlorobutadiene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Indeno(1,2,3-cd)pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Isopropanol	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Isopropyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Isopropyl alcohol (2-Propanol)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Isopropylbenzene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Isopropylbenzene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
m+p-Xylenes	EPA TO-15	Volatile Organics	NELAP	12/21/2012
m+p-Xylenes	MADEP APH	Volatile Organics	NELAP	12/21/2012
Methoxychlor	EPA TO-10A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Methoxychlor	EPA TO-4A	Pesticides-Herbicides-PCB's	NELAP	12/21/2012
Methyl bromide (Bromomethane)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl chloride (Chloromethane)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl chloride (Chloromethane)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methyl methacrylate	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl tert-butyl ether (MTBE)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methyl tert-butyl ether (MTBE)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Methyl tert-butyl ether (MTBE)	MADEP APH	Volatile Organics	NELAP	12/21/2012
Methylene chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Methylene chloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
m-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Naphthalene	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
Naphthalene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
Naphthalene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Naphthalene	MADEP APH	Volatile Organics	NELAP	12/21/2012
n-Butyl acetate	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
n-Butyl alcohol	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010

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Attachment to Certificate #: E871020-12, expiration date June 30, 2014. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
n-Decane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Dodecane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Heptane	EPA TO-15	Volatile Organics	NELAP	7/9/2010
n-Heptane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Hexane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
n-Hexane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Nonane	CASS TO-15/GC-MS	Volatile Organics	NELAP	12/27/2007
n-Octane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Octane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
n-Propylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
n-Undecane	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
o-Ethyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
o-Xylene	EPA TO-15	Volatile Organics	NELAP	12/21/2012
o-Xylene	MADEP APH	Volatile Organics	NELAP	12/21/2012
Phenanthrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
p-Isopropyltoluene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Propylene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Pyrene	EPA TO-13A	Extractable Organics	NELAP	12/27/2007
sec-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Styrene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Styrene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
T-amylmethylether (TAME)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
tert-Butyl alcohol	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
tert-Butylbenzene	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Tetrachloroethylene (Perchloroethylene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Tetrachloroethylene (Perchloroethylene)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Tetrahydrofuran (THF)	CASS TO-15/GC-MS	Volatile Organics	NELAP	7/9/2010
Tetrahydrofuran (THF)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Toluene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Toluene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Toluene	MADEP APH	Volatile Organics	NELAP	12/21/2012
trans-1,2-Dichloroethylene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
trans-1,2-Dichloroethylene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
trans-1,3-Dichloropropene	EPA TO-15	Volatile Organics	NELAP	12/27/2007
trans-1,3-Dichloropropene	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Trichloroethene (Trichloroethylene)	EPA TO-15	Volatile Organics	NELAP	12/27/2007

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State Laboratory ID: E871020 **EPA Lab Code: CA01627** **(805) 526-7161**

E871020
ALS Environmental - Simi Valley
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
Trichloroethene (Trichloroethylene)	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Trichlorofluoromethane	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Trichlorofluoromethane	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Vinyl acetate	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Vinyl chloride	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Vinyl chloride	EPA TO-17	Volatile Organics	NELAP	7/9/2010
Xylene (total)	EPA TO-15	Volatile Organics	NELAP	12/27/2007
Xylene (total)	EPA TO-17	Volatile Organics	NELAP	7/9/2010

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APPENDIX C

EXAMPLE FIELD DATA RECORDS

AIR SAMPLING FIELD DATA RECORD

AIR SAMPLING FIELD DATA RECORD

Project Name: CTS of Asheville, Inc. **Project Numer:** _____

Sampling Personnel: _____ **Sample ID:** _____

Sample Address: _____ **Sample Location*:** _____

Canister ID: _____ **Flow Controller ID:** _____

	Start	**Stop**
Sample Date:		
Sample Time:		
Canister Pressure:**		
Outdoor Temperature:**		
Interior Temperature:**		
PID Reading (ppm):		
Wind Direction:		

Antecedent weather conditions:

Weather conditions during sample period:

Sketch of sampling area:

* Indicate crawlspace or ambient and approximate height of air intake.

** Indicate unit of measurement.

PHOTOGRAPH RECORD

PHOTOGRAPH RECORD

Project Name: CTS of Asheville, Inc. Superfund Site **Project Number:** _____

Date/Time: _____ **Taken By:** _____

File Name	Direction of Photo	Description

APPENDIX D

ALS ENVIRONMENTAL
STANDARD OPERATING PROCEDURE FOR CLEANING AND CERTIFICATION OF SUMMA CANISTERS AND OTHER SPECIALLY-PREPARED CANISTERS

APPENDIX E

ALS ENVIRONMENTAL
STANDARD OPERATING PROCEDURE FOR EVALUATION AND PRESSURIZATION OF SPECIALLY PREPARED STAINLESS STEEL CANISTERS

APPENDIX F

ALS ENVIRONMENTAL

STANDARD OPERATING PROCEDURE FOR DETERMINATION OF VOLATILE ORGANIC COMPOUNDS IN AIR SAMPLES COLLECTED IN SPECIALLY PREPARED CANISTERS AND GAS COLLECTION BAGS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

APPENDIX C

OCCUPIED DWELLING QUESTIONNAIRE

OCCUPIED DWELLING QUESTIONNAIRE

Indoor Air Assessment Survey

Date: _____

1. Name:_____

   Address:_____

   _____

   Home Phone:_____ Work Phone:_____

2. What is the best time to call to speak with you?_____ At: Work ❑ or Home ❑?

3. Are you the Owner ❑, Renter ❑, Other ❑ (please specify)_____ of this Home/Structure?

4. Total number of occupants/persons at this location?_____
   Number of children? _____ Ages?_____

5. How long have you lived at this location? _____

General Home Description

6. Type of Home/Structure (check only one): Single Family Home ❑, Duplex ❑, Condominium❑, Townhouse ❑, Other ❑_____

7. Home/Structure Description: number of floors _____
   Basement? Yes ❑ No ❑
   Crawl Space? Yes ❑ No ❑
   If Yes, under how much of the house's area? ____%

8. Age of Home/Structure: _____ years, Not sure/Unknown ❑

9. General Above-Ground Home/Structure construction (check all that apply):
   Wood ❑, Brick ❑, Concrete ❑, Cement block ❑, Other ❑_____

10. Foundation Construction (check all that apply):
    Concrete slab ❑
    Fieldstone ❑
    Concrete block ❑

Elevated above ground/grade ❑
Other_____

11. What is the source of your drinking water (check all that apply)?
Public water supply ❑
Private well ❑
Bottled water ❑
Other, please specify _____

12. Do you have a private well for purposes other than drinking?
Yes ❑ No ❑
If yes, please describe what you use the well for:_____
_____

13. Do you have a septic system? Yes ❑ No ❑ Not used ❑ Unknown ❑

14. Do you have standing water outside your home (pond, ditch, swale)? Yes ❑ No ❑

Basement Description, please check appropriate boxes.
If you do not have a basement go to question 23.

15. Is the basement finished ❑ or unfinished ❑?
16. If finished, how many rooms are in the basement?_____
How many are used for more than 2 hours/day?_____
17. Is the basement floor (check all that apply) concrete ❑, tile ❑, carpeted ❑, dirt ❑, other❑(describe)_____?
18. Are the basement walls poured concrete ❑, cement block ❑, stone ❑, wood ❑, brick ❑, other❑_____?
19. Does the basement have a moisture problem (check one only)?
Yes, frequently (3 or more times/yr) ❑
Yes, occasionally (1-2 times/yr) ❑
Yes, rarely (less than 1 time/yr) ❑
No ❑

20. Does the basement ever flood (check one only)?
Yes, frequently (3 or more times/yr) ❑
Yes, occasionally (1-2 times/yr) ❑
Yes, rarely (less than 1 time/yr) ❑
No ❑

21. Does the basement have any of the following? (check all that apply) Floor cracks ❑, Wall cracks ❑, Sump ❑, Floor drain ❑, Other hole/opening in floor ❑
(describe)_____

22. Are any of the following used or stored in the basement (check all that apply)
Paint ❑ Paint stripper/remover ❑ Paint thinner ❑
Metal degreaser/cleaner ❑ Gasoline ❑ Diesel fuel ❑ Solvents ❑ Glue ❑
Laundry spot removers ❑ Drain cleaners ❑ Pesticides ❑

23. Have you recently (within the last six months) done any painting or remodeling in your home? Yes ❑ No ❑
If yes, please specify what was done, where in the home, and what month:
_____
_____

24. Have you installed new carpeting in your home within the last year? Yes ❑ No ❑
If yes, when and where?_____

25. Do you regularly use or work in a dry cleaning service (check only one box)?
Yes, use dry-cleaning regularly (at least weekly)❑
Yes, use dry-cleaning infrequently (monthly or less)❑
Yes, work at a dry cleaning service ❑
No ❑

26. Does anyone in your home use solvents at work?
Yes ❑ If yes, how many persons_____
No ❑ If no, go to question 28

27. If yes for question 26 above, are the work clothes washed at home? Yes ❑ No ❑

28. Where is the washer/dryer located?
Basement ❑
Upstairs utility room ❑
Kitchen ❑
Garage ❑
Use a Laundromat ❑
Other, please specify ❑_____

29. If you have a dryer, is it vented to the outdoors? Yes ❑ No ❑

30. What type(s) of home heating do you have (check all that apply)
Fuel type: Gas ❑, Oil ❑, Electric ❑, Wood ❑, Coal ❑, Other_____
Heat conveyance system:
Forced hot air ❑
Forced hot water ❑
Steam ❑
Radiant floor heat ❑
Wood stove ❑
Coal furnace ❑
Fireplace ❑
Other_____

31. Do you have air conditioning? Yes ❑ No ❑. If yes, please check the appropriate type(s)
Central air conditioning ❑
Window air conditioning unit(s)❑
Other ❑, please specify_____

32. Do you use any of the following? Room fans ❑, Ceiling fans ❑, Attic fan ❑
Do you ventilate using the fan-only mode of your central air conditioning or forced air heating system? Yes ❑ No ❑

33. Has your home had termite or other pesticide treatment: Yes ❑ No ❑ Unknown ❑
If yes, please specify type of pest controlled, _____
and approximate date of service _____

34. Water Heater Type: Gas ❑, Electric ❑, By furnace ❑, Other ❑_____
Water heater location: Basement ❑, Upstairs utility room ❑, Garage ❑, Other ❑ (please describe) _____

35. What type of cooking appliance do you have? Electric ❑, Gas ❑, Other ❑_____

36. Is there a stove exhaust hood present? Yes ❑ No ❑
Does it vent to the outdoors? Yes ❑ No ❑

37. Smoking in Home:
None ❑, Rare (only guests)❑, Moderate (residents light smokers)❑,
Heavy (at least one heavy smoker in household)❑

38. If yes to above, what do they smoke?
Cigarettes ❑ Cigars ❑
Pipe ❑ Other ❑

39. Do you regularly use air fresheners? Yes ❑ No ❑

40. Does anyone in the home have indoor home hobbies of crafts involving: None ❑
Heating ❑, soldering ❑, welding ❑, model glues ❑, paint ❑, spray paint, wood finishing ❑, Other ❑ Please specify what type of hobby: _____
_____

41. General family/home use of consumer products (please circle appropriate): Assume that **Never** never used, **Hardly ever** less than once/month, **Occasionally** about once/month, **Regularly** about once/week, and **Often** more than once/week.

Product	Frequency of Use				
Spray-on deodorant	Never	Hardly ever	Occasionally	Regularly	Often

Aerosol deodorizers	Never	Hardly ever	Occasionally	Regularly	Often
Insecticides	Never	Hardly ever	Occasionally	Regularly	Often
Disinfectants	Never	Hardly ever	Occasionally	Regularly	Often

(Question 41, continued)

Product	Frequency of Use				
Window cleaners	Never	Hardly ever	Occasionally	Regularly	Often
Spray-on oven cleaners	Never	Hardly ever	Occasionally	Regularly	Often
Nail polish remover	Never	Hardly ever	Occasionally	Regularly	Often
Hair sprays	Never	Hardly ever	Occasionally	Regularly	Often

42. Please check weekly household cleaning practices:
Dusting ❑
Dry sweeping ❑
Vacuuming ❑
Polishing (furniture, etc) ❑
Washing/waxing floors ❑
Other ❑_____

43. Other comments: _____
_____
_____
_____
_____
_____
_____
_____
_____